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EPA Superfund
Record of Decision:

TULALIP LANDFILL
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MARYSVILLE, WA
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RECORD OF DECISION

TULALIP LANDFILL SUPERFUND SITE
INTERIM REMEDIAL ACTION
MARYSVILLE, WASHINGTON

March 1996

U.S. Environmental Protection Agency

Region 10

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DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Tulalip Landfill Superfund Site
Marysville, Washington

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the Tulalip Landfill near Marysville, Washington, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this interim action. The landfill is located within the boundary of the Tulalip Indian Reservation. The Tulalip Tribes of Washington concur with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent or substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The interim remedy documented by this interim ROD is designed to protect public health and the environment by containing and preventing contact with the landfill wastes. Major elements of the selected remedy include:

- capping the landfill in accordance with the Washington State Minimum Functional Standards (MFS) for landfill closure
- installing a landfill gas collection system. If necessary, a gas treatment system will also be installed
- monitoring the leachate mound within the landfill, the perimeter leachate seeps, and landfill gas to ensure the selected remedy is adequately containing the landfill wastes
- restrictions to protect the landfill cap
- providing for operation and maintenance (O&M) to ensure the integrity of the cap system

The selected remedy is expected to stem the migration of contaminants from the landfill into the surrounding estuary by minimizing the amount of rain water infiltrating the wastes, thereby minimizing the generation of new leachate.

The selected interim remedy is expected to allow productive use of the landfill surface, with restrictions to prevent damage the cover system. The interim remedy shall be designed and constructed to be compatible with the types of future use activities described in the Big Flats Land Use Program, Tulalip Landfill Remedial Investigation and Feasibility Study (July 10, 1994). When design and construction of the interim remedy are complete, EPA and the Tulalip Tribes shall develop a document titled "Routine Use of Tulalip ('Big Flats') Landfill," the purpose of which shall be to ensure the continued integrity of the cover system.

Statutory Determinations

The selected interim remedial action is protective of human health and the environment, complies with Federal, State, and Tribal requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This interim remedial action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site. The presumptive remedy approach for municipal landfills utilizes the remedial approach of containment of wastes rather than treatment of wastes. Because this action does not constitute the final remedy for the Site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element may be addressed by the final response action.

Because the interim remedial action will result in hazardous substances remaining on-site above health-based levels, a review will be conducted no less often than every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Because this is an interim action ROD, review of this site and this interim remedy will be ongoing as EPA continues to develop final remedial alternatives for the wetlands surrounding the landfill.

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LIST OF ACRONYMS

AAL	Acceptable Ambient Levels
AET	Apparent Effects Threshold
AMBS	Area of Major Biological Significance
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BIA	Bureau of Indian Affairs
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQA	Construction Quality Assurance
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DOD	Department of Defense
EPA	Environmental Protection Agency
FML	Flexible Membrane Liner
FS	Feasibility Study
FWPCA	Federal Water Pollution Control Act
FWQC	Federal Water Quality Criteria
gm	gram
HEAST	Health Effects Assessment Summary Tables
IRIS	Integrated Risk Information System
MCC	Marine Chronic Criteria
MFS	Minimum Functional Standards
MOA	Memorandum of Agreement
MSL	Mean Sea Level
MTCA	(Washington) Model Toxics Control Act
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTR	National Toxics Rule
OSWER	(EPA) Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
POTW	Publicly Owned Treatment Works
ppm	parts per million
PQL	Practical Quantitation Limit
PRP	Potentially Responsible Party
PSAPCA	Puget Sound Air Pollution Control Authority
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SACM	Superfund Accelerated Cleanup Model
SARA	Superfund Amendments and Reauthorization Act
SDC	Seattle Disposal Company
SMA	Shoreline Management Act
SP	Seep
TBC	To Be Considered
USCS	Unified Soil Classification System
WAC	Washington Administrative Code

1.0 SITE DESCRIPTION

1.1 PHYSICAL SETTING

The Tulalip Landfill occupies approximately 147 acres and is located on a low-lying island (commonly referred to as North Ebey Island) in the Snohomish River delta. This island is within the floodplain of the Snohomish River. Located within the bounds of the Tulalip Indian Reservation, the landfill lies generally between Marysville and Everett, Washington (see Figure 1-1). North Ebey Island is bounded to the north by Ebey Slough and to the south by Steam-boat Slough. The island is located in Snohomish County, Township 30N, Range SE, Section 32.

Prior to landfilling activities, the land on which the landfill is located consisted of relatively undisturbed intertidal wetlands, and reached heights of about 3 to 6 feet above mean sea level (MSL). Today, the landfill reaches heights of about 12 to 20 feet above MSL. The landfill is bounded by a perimeter berm that is approximately 15 feet high. During landfilling operations, barge canals were cut into the island to allow water barges bearing refuse to transport waste into the landfill. Initially, waste was removed from the barges and placed directly on top of adjacent wetlands. During later operations, wetlands adjacent to the canals were dredged prior to placing the waste into the dredged areas. In general, these barge canals were deeper than other parts of the landfill. The former barge canals, which are now filled with waste, and other physical features of the Tulalip Landfill area are shown in Figure 1-2. The average depth of fill throughout most of the landfill is about 17 feet; in the old barge canals the fill depth reaches about-30 feet. Three to four million tons of mixed commercial and industrial waste were deposited in the landfill during its period of operation from 1964 to 1979. The waste is covered with silt, silty sand, clay and medium sand, and demolition and construction debris at depths up to 11 feet.

The results of Remedial Investigation (RI) indicate that there is a mound of contaminated ground water (landfill "leachate) within the landfill waste. This leachate mound is fed by precipitation, and its height varies between approximately 10-16 feet above MSL. Because the mound is considerably higher than the mean sea level and the ground water level surrounding the landfill, the weight of this leachate mound drives landfill contaminants out and away from the landfill. Some of the leachate (between approximately 5-35%) is pushed out the outer edge of the perimeter berm and flows onto wetlands and into tidal channels surrounding the landfill. Most of the leachate seeps occur on the outside of the landfill berm, but one seep that was sampled during the RI (SP-01) originates on the landfill surface. The remainder of the leachate (approximately 65-95%) is driven downward by the weight of the leachate mound into ground water beneath the landfill, where it migrates outward and is discharged to waterways surrounding the landfill.

The leachate mound is primarily freshwater. The mound is maintained mainly by precipitation, which falls in significant quantities in the Puget Sound region. The landfill vicinity typically receives between 35 and 40 inches of rain per year, and experiences a rainy season (October to March) and a dry season (April to September). In general, the leachate mound rises during the rainy season, which is accompanied by visibly greater amounts of leachate discharging through the perimeter seeps. During the dry season the height of the mound falls, and the amount of leachate discharging through the seeps decreases to levels where some of the seeps cease to flow.

Commercial harvests of invertebrates and demersal and anadromous fish occur in the immediate vicinity of the landfill each year. The adjacent river system supports commercial and sport fisheries. Important commercial species in the vicinity of the Site include pink, chum, coho, and chinook salmon; steelhead and cutthroat trout; American shad, English sole, and Dungeness crab. Site access is currently restricted, and the wetlands adjacent to the west of the Site remain relatively undisturbed by human activity. Additional wetlands lie immediately north of Ebey Slough. People live north of Ebey Slough. The nearest residence is located approximately 600 feet away from the landfill perimeter. **1** Smith Island is located south of Steamboat Slough.

Ground water beneath the Site is brackish and therefore unusable as a potable water source. Site studies indicate that contaminated ground water from the landfill migrates to the wetlands and sloughs surrounding the Site and does not pose a threat to ground water drinking water sources located across the sloughs.

1 Personal communication, Eric Winiecki, EPA, and Tom McKinsey, Tulalip Tribes, February 8, 1996.

1.2 ECOLOGICAL SETTING

The areas surrounding the landfill have significant aesthetic, environmental, economic, and recreational value. The landfill is located within the Puget Sound Estuary, one of 28 estuaries in the country that has been targeted for protection and restoration under the National Estuary Program, which was

established by Congress in 1987 as part of the Clean Water Act. The State of Washington has classified the surface waters surrounding the Site as "Class A" waters of the State, which are characterized as generally "excellent" waters, where water quality meets or exceeds the requirements for all, or substantially all, designated uses.[2] The tidal mudflats and marsh habitats surrounding the landfill are natural resources that provide spawning and foraging areas for wildlife species. The Snohomish River delta is designated as a Washington Shoreline of Statewide Significance by the Washington State Department of Ecology, and designated as an Area of Major Biological Significance (AMBS) for American shad and English sole by the U.S. Fish and Wildlife Service.

The landfill is surrounded on all sides by environmentally sensitive wetlands, including an area of approximately 160 acres of salt marsh and mudflats located immediately west of the landfill. These wetlands have an important environmental role in the Snohomish River delta as sources and sinks for nutrients, sediment retention areas, and habitat transition zones. Wetlands serve as unique ecosystems that support highly diverse and abundant wildlife species. Plant species in the area, such as cattail, bulrush, and sedge, provide shelter, feeding, and nesting areas for wildlife. These plants serve as a food source for waterfowl and other aquatic animals.

The Snohomish River supports a diverse aquatic community. One of the most important functions of estuarine wetlands is that they provide nursery areas for many fish and wildlife species. The tidal mudflats and emergent marsh habitat in the vicinity of the Tulalip Landfill serve as spawning, nursery and feeding habitats for a diverse population of demersal fish and invertebrates.

Species that live in the estuarine wetlands around the Tulalip Landfill include shorebirds and waterfowl, marsh hawk, coyote, otter, and deer. Aquatic species residing in the Tulalip Landfill area include salmon, cutthroat trout, clams, mussels, shrimp, and juvenile Dungeness crab. Species of concern under the federal Endangered Species Act or comparable Washington State regulations that have been observed in the vicinity of the Site, or that may be expected to use habitat areas near the Site, are listed in Table 1-1. The bald eagle and the stellar (northern) sea lion are considered threatened under State and Federal law. A plant, the choriso bog orchid, has State status as a threatened species.

The Tulalip Landfill is situated within this ecologically valuable ecosystem. Contaminated leachate from the landfill discharges directly into wetlands that carry on critical habitat functions. Over the years, human activities have increasingly led to the destruction and degradation of such wetland areas within the Snohomish River delta. As such wetland resources become more scarce, the importance of protecting and preserving the remaining areas for future generations becomes crucial. The results of the streamlined baseline Risk Assessment for Interim Remedial Action (the "Streamlined Risk Assessment") indicate that the landfill acts as a chronic source of contamination to the surrounding environment, and that ongoing chemical discharges from the Tulalip Landfill are resulting in potentially harmful effects to animals living on and around the landfill.

[2] Chapter 173-201 Washington Administrative Code (WAC), Water Quality Standards for Surface Waters of the State of Washington, January 6, 1988.

2.0 SITE HISTORY AND ENFORCEMENT ACTIONS

The Tulalip Tribes of Washington

The Tulalip Tribes of Washington (the Tribes) is a federally recognized Indian Tribe organized under Section 16 of the Indian Reorganization Act of 1934, as amended, 25 U.S.C. § 476. The lands on which the landfill is located are currently held by the United States in trust. The landfill is located on two property parcels, one of which generally includes the eastern half of the landfill, and the other includes the western half. The Tribes established the Tulalip Section 17 Corporation, a federal corporation chartered pursuant to Section 17 of the Indian Reorganization Act, 25 U.S.C. § 477, which is the trust beneficiary of the westerly parcel that was accepted into trust by the United States in 1960. The Tulalip Tribes is the trust beneficiary of the easterly parcel, accepted into trust in 1971.

To assist the Tribes' involvement in the Superfund process, the Region entered into a Memorandum of Agreement (MOA) with the Tribes on February 11, 1992. The MOA was amended on September 9, 1992, to include the Bureau of Indian Affairs as a signatory The Region also granted the Tribes a Superfund support agency cooperative agreement under Section 104 of CERCLA, which provides funds to support the Tribes' Superfund coordinator.

Operation of the Landfill 1964-1979

In 1964, the Tulalip Section 17 Corporation, as authorized by a resolution of the Tribes, leased the landfill Site to the Seattle Disposal Company (SDC) for a 10 year period. A second lease was executed in

1972. From 1964 to 1979, SDC operated the landfill under the direction of its general partners, Josie Razore, John Banchero, and Alphonso Morelli. Known then as "Big Flats Landfill", the Site handled commercial and industrial waste. The leases between the Tulalip Section 17 Corporation and Seattle Disposal allowed specified waste disposal and related activities for a "sanitary land fill operation" and required a "cleanup" of the Site. For the most part, the landfill did not accept putriscible wastes, although the Tribes were allowed to dispose of garbage. It was never intended that the landfill accept putriscible waste or function in the capacity of a municipal landfill. Between 1964 and 1979, it is reported that approximately three to four million tons of mixed commercial and industrial waste was deposited in the landfill.

Because of ongoing environmental problems associated with the landfill operations, EPA filed a complaint in 1977 to permanently stop the use of the landfill for disposal of waste. In 1979 the landfill was closed and covered pursuant to the Rivers and Harbors Act of 1899, 33 U.S.C. §§403 and 407, and the Federal Water Pollution Control Act, 33 U.S.C. §§1311, 1319, 1341, and 1344, in accordance with a consent decree entered in U.S. District Court for the Western District of Washington on October 19, 1977, and amended on May 12, 1978. The closure, fully funded by SDC, required the construction of a perimeter berm around the landfill waste disposal area, and placement of cover soils after final grading of the surface. Recent Site studies indicate the waste is covered with approximately 12 inches to 11 feet of soil. However, the landfill surface was left relatively flat, which subsequently resulted in poor drainage and ponding of water on the landfill surface.

Operations at the Landfill after 1985

In 1985, the Tulalip Tribes of Washington sought to place a thicker soil cap over the landfill to address ongoing leachate discharges at the Site. At the time, the Tribes hoped to obtain surface grade materials from construction of a tunnel for Interstate 90 leading into Seattle.

In order to perform the work, the Tribes applied to the Army Corps of Engineers in March 1985 for a dredge and fill permit pursuant to the Clean Water Act, 33 U.S. C. § 1342, to build a dock for delivery of materials to the landfill. The Corps granted the permit a year later, in March 1986.

In 1985, the Tribes also applied to EPA for a National Pollutant Discharge Elimination System ("NPDES") Permit for placement of material on the landfill surface. The Corps had decided to not include the placement of additional fill in a CWA 404 permit, writing to Tribes that the proposed capping project was properly authorized pursuant to Section 402 of the Clean Water Act under an NPDES permit. The Corps based its reasoning on the fact that the Corps characterized the Tribes' efforts to install a more effective cover over the Tulalip Landfill wastes as "an essential feature of the landfill/wasting operation" at the Site which the Corps believed was subject to Section 402 of the CWA. EPA issued a five year NPDES permit in February of 1986, which allowed the placement of low permeability soils as approved by EPA, and required the collection of leachate. The permit was amended in March 1987 to allow for the placement of approved materials from other projects, when the Tribe did not obtain soils from the I-90 tunnel.

From late 1986 to 1990, the Tulalip Section 17 Corporation, in a joint venture with SEBB Corporation, **3** contracted with R.W. Rhine for the placement of capping materials. R.W. Rhine brought materials from several demolition projects, including approximately 200,000 cubic yards of debris generated by the demolition of structures from the U.S. Navy's construction of a new "home port" in Everett, Washington. Rhine used the materials brought to the Site to build a road network for "cells" to be filled in during the capping project. An information request response from R.W. Rhine lists the sources of additional capping materials and demolition wastes that were deposited at the landfill.

In 1990, EPA corresponded with the Tribes regarding the disposal of materials without EPA approval. EPA's letter recommended that the Tribes cease the voluntary capping effort, and comply with the NPDES permit requirement to collect leachate. In 1991, the Tribes wrote EPA that they would not apply to renew the NPDES permit.

The National Priorities List (NPL)

In February and March 1988, EPA contractor Ecology & Environment, Inc. (E&E) performed a Site Inspection of the landfill for NPL evaluation. The inspection revealed groundwater contamination with unacceptably high levels of arsenic, barium, cadmium, chromium, lead, mercury, and silver. Water samples taken in the wetlands adjacent to the Site showed exceedences of marine chronic criteria for cadmium, chromium, and lead as well as exceedences in marine acute criteria for copper, nickel and zinc. In addition, a variety of metals were found in on-site pools and leachate. The study concluded that contamination was migrating off-site.

3 SEBB Corporation no longer exists.

On July 29, 1991, EPA proposed adding the Tulalip Landfill to the National Priorities List (NPL). Although the public comment period on the proposed NPL listing closed in October 1991, SDC made 11 submissions of comments between May 1993 and February 1995. On April 25, 1995, with the support of the governor of the State of Washington, EPA published the final rule adding the Site to the NPL. In July 1995, SDC and the University of Washington filed petitions to challenge the NPL rule in the U.S. Court of Appeals for the District of Columbia. This litigation is ongoing.

The Remedial Investigation and Feasibility Study

In August 1993, EPA signed an Administrative order on Consent with several Potentially Responsible Parties (the Respondents)4 to conduct a Remedial Investigation and Feasibility Study (RI/FS). These parties include Seattle Disposal Company, Marine Disposal, Josie Razore, John Banchero, Washington Waste Hauling and Recycling, Inc., Rubatino Refuse Removal, Inc., Monsanto Company, and the Port of Seattle.

Site investigation efforts, including sampling done recently by the Respondents **4** as part of the Remedial Investigation (RI), show that landfill leachate leaving the Site exceeds water quality criteria and standards for pesticides such as DDT, heptachlor, and aldrin, polychlorinated biphenyls (commonly known as PCBs), and heavy metals and other contaminants including chromium, copper, lead, mercury, nickel, zinc, and ammonia. This leachate flows directly into sensitive, ecologically valuable wetlands that surround the Site, and into sloughs connected with the Snohomish River and Puget Sound. The RI documents the presence of hazardous substances in the soils, sediments, surface water, and ground water at the Site.

Citizen Suit under Clean Water Act and Resource Conservation and Recovery Act (RCRA)

On March 30, 1994, Josie Razore and John Banchero filed suit against the Tulalip Tribes, the Tulalip Section 17 Corporation, The Bureau of Indian Affairs (BIA) and Carol Browner, Administrator of the Environmental Protection Agency (EPA). The complaint alleged that the defendants Tulalip Tribes, Tulalip Section 17 Corporation, and BIA were in violation of their NPDES permit and Section 301(a) of the Clean Water Act. The complaint was amended to add counts under the citizen suit provision of the Resource Conservation and Recovery Act (RCRA). In addition, the complaint alleged that EPA has a mandatory duty to enforce the NPDES permit and provisions of the CWA and RCRA.

The plaintiffs requested that the court enjoin further violations of the CWA and RCRA, issue an injunction ordering the defendants to stop the discharge of leachate without a permit, and assess penalties for violation of the CWA and RCRA.

On September 23, 1994, the court dismissed the lawsuit, holding that the court was deprived of jurisdiction pursuant to CERCLA Section 113(h). The court found that the plaintiffs remedy was "clearly" a "challenge" in its attempt to dictate specific remedial actions at a Superfund Site and alter the method and order for cleanup during an RI/FS and prior to a determination of the ultimate remedial plan. The Plaintiffs appealed the dismissal to the U.S. Court of Appeals for the Ninth Circuit. The plaintiffs subsequently filed with the court an Appellants Memorandum of Emergency Motion for Injunction Pending Appeal, which cited testimony from their expert (Ellingsworth) that leachate is discharging from the Tulalip Landfill Site at levels exceeding water quality criteria so that water quality will"fall below the level that will sustain fish and other aquatic life in the waters surrounding the landfill." The plaintiffs' emergency motion was denied by the court. on September 19, 1995, the U.S. Court of Appeals for the Ninth Circuit filed an opinion upholding dismissal of the lawsuit.

4 For the purposes of this interim ROD, "Respondents" refers to some or all of the PRPs that signed the RI/FS AOC.

Invocation of Dispute Resolution Under the 1993 AOC

On February 17, 1995, the Respondents to the 1993 AOC for the conduct of the RI/FS invoked dispute resolution under Paragraph 61 of the AOC with respect to a number of issues including:

(l) EPA's denial of Respondents' request to modify the RI/FS Work Plan to allow for the performance of additional work under the AOC;

(2) the elimination of two remedial action alternatives during the screening process; **5**

(3) the exclusion of institutional controls as a stand-alone remedy;

(4) brackish water AWQC evaluations;

(5) dissolved metals data in the evaluation of alternatives and their compliance with ARARs; and

(6) mixing zones for measuring compliance with AWQCs.

5 Detailed discussion of these two alternatives is provided in Section 8.12 - Other Alternatives.

On October 18, 1995, EPA Region 10's Deputy Regional Administrator issued a final determination on the issues stated above:

(1) EPA denied the request to modify-the Work Plan because the request was untimely, would delay cleanup, was inconsistent with the RI, was structurally flawed, and was not needed to support the Source Area Containment Feasibility Study (FS);

(2) EPA determined that the two disputed alternatives were appropriately eliminated during the screening process and should not be included in the FS, because they did not comply with CERCLA, the NCP, and EPA guidance;

(3) EPA determined that institutional controls, as a stand-alone remedy, was appropriately excluded from the FS during the screening process;

(4) EPA determined that the use of brackish water AWQC evaluations in the SAC-4 report was inappropriate and inconsistent with State law, CERCLA, and the NCP;

(5) EPA determined that the use of limited dissolved metal data did not prejudice RI/FS data collection and evaluation efforts; and

(6) EPA determined that mixing zones would not be used for measuring compliance with AWQC.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

CERCLA requirements for public participation include releasing the Remedial-Investigation and Feasibility Study (RI/FS) Reports and the Proposed Plan to the public and providing a public comment period on the Feasibility Study and Proposed Plan. EPA met these requirements by placing both documents in the public information repositories for the Site prior to the start of the public comment period. EPA mailed copies of a fact sheet summarizing the Proposed Plan on August 4, 1995 to individuals on the mailing list. The fact sheet explained how interested parties could get copies of the entire Proposed Plan. Extra copies of the Proposed Plan were also made available at the Marysville Public Library. EPA published a notice of the release of the RI/FS and Proposed Plan in the Everett Herald on August 4, 1995, and the weekly Marysville Globe on August 9, 1995. Notice of the 30 day public comment period and the public meeting discussing the proposed plan were included in-the newspaper notice. Prior to issuance of the Proposed Plan, the PRPs requested a 30 day public comment period extension, which EPA granted. A public meeting was held on August 22, 199S, at the Snohomish County Public Utility District Auditorium in Everett, Washington. The PRPs requested an additional public comment period extension, which EPA granted by extending the comment period to October 25, 1995, for a total comment period of 80 days. At the request of one of the Potentially Responsible Parties, a second public meeting was held on October 3 in Seattle. Written public comments received during the comment period, and transcripts of the public meetings, are included in the Administrative Record.

To date, the following Superfund community relations activities have been conducted by EPA at the Tulalip Landfill Site:

December 1987	EPA released a fact sheet announcing a sampling effort.
September 1988	EPA released a fact sheet summarizing the findings of the Site investigation.
July 1991	EPA released a fact sheet announcing the proposal of the Tulalip Site to the National Priorities List.
September 1993	EPA released a fact sheet which explained the Superfund process and announced plans to talk to citizens about concerns related to the Tulalip Site.
November 1993	EPA released the Community Relations Plan.
November 1993	A fact sheet is released announcing the beginning of the remedial investigation.
January 25, 1995	EPA mailed an update of the activities at the Site, which included a general description of the presumptive remedy containment approach and its application to the Tulalip Site.

August 4, 1995	EPA mailed a fact sheet summarizing the Proposed Plan for interim cleanup.
August 4, 1995	EPA released the Proposed Plan.
August 4, 1995	Newspaper Ad ran in the Everett Herald announcing the public comment period and the date and time of the public meeting.
August 9, 1995	Same newspaper ad from August 4, 1995, ran in the Marysville Globe.
August 14, 1995	EPA received a request from one of the Potentially Responsible Parties to extend the public comment period. EPA ran a newspaper ad in the Everett Herald announcing the extension to the public comment period.
August 22, 1995	Public meeting on the Tulalip Landfill Site.
September 1995	EPA released a fact sheet announcing the extension to the public comment period and announcing the time and location of an additional public meeting.
September 20, 1995	EPA ran a newspaper ad in the Everett Herald and in the Marysville Globe announcing another extension on the public comment period and an additional public meeting to discuss the Proposed Plan.
October 3, 1995	EPA held an additional public meeting, at the request of one of the Potentially Responsible Parties, to discuss the Proposed Plan. The meeting was held from 10:00 a.m. to 5:30 p.m. in Seattle.
October 25, 1995	Comment Period closed.

Selection of the interim remedy is based on the Administrative Record. There are two copies of the Administrative Record available for public review. One copy is located at the EPA Region 10 office at 1200 Sixth Avenue, in Seattle, Washington. The second copy is located at the Marysville Public Library in Marysville, Washington.

4.0 SCOPE AND ROLE OF INTERIM RESPONSE ACTION

Based on EPA's experience of evaluating Superfund remedies at many landfill sites across the country, the remedy for landfills almost universally consists of containing the landfill wastes in place to prevent migration of contaminants off of the Site. **6** Waste in Superfund landfills usually is present in large volumes and is a heterogeneous mixture of commercial, industrial, hazardous and municipal wastes. Consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (or NCP), EPA's expectation is that containment technologies will be appropriate for landfill waste because the volume and heterogeneity of the waste generally make treatment impractical. For the source areas **7** of "Superfund" landfill sites, EPA generally considers containment to be the appropriate response action, or the "presumptive remedy." The objective of using a presumptive remedy approach is to use past experience to streamline site investigation, to speed up selection of cleanup actions, and to increase the cost effectiveness of the remedy selection process.

Containment remedies usually include installing a low permeability cover to keep rain water from filtering down through the landfill wastes. Containment may also include some form of leachate collection and treatment, some form of landfill gas collection, or some form of ground water control. EPA has published several guidance documents that EPA Region 10 used to design the RI/FS work plan that the Respondents followed, including a streamlining manual entitled Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, February 1991 (OSWER Directive 9355.3-11) (also referred to later as the Municipal Landfill Manual), Presumptive Remedies for Municipal Landfill Sites, April 1992 and February 1993 (EPA Publication 9203.1-021), Presumptive Remedies, August 1992 (SACM Bulletin Vol. 1, No.3), and Streamlining the RI/FS for CERCLA Municipal Landfill Sites, September 1990. In addition, as described below, EPA has conducted an analysis of potentially available technologies for CERCLA landfills and found that certain technologies are routinely and appropriately screened out on the basis of effectiveness, feasibility, or cost, consistent with NCP Section 300.430(e)(7). The Feasibility Study Analysis for CERCLA Municipal Landfills, September 1993, provides an evaluation of 30 CERCLA landfill FS reports that support initial identification and screening of technologies for selection of the landfill remedy.

6 Presumptive Remedy for CERCLA Municipal Landfill Sites (EPA 540-F-93-035, OSWER Directive #9355.0-49FS, September, 1993).

7 In general, a "source area" refers to an area of a site that acts as a contaminant source to other areas.

This streamlined presumptive remedy approach is appropriate at Tulalip Landfill. In the RI/FS Work Plan (which is part of the RI/FS AOC), the Tulalip Landfill was deemed appropriate for remedial action because concentrations of contaminants at the landfill exceeded the established standards of ambient water quality criteria (RI/FS Work Plan, page 4-1). Containment is the presumptive remedy which EPA found to be most commonly suited for municipal landfills because these landfills, as well as the Tulalip Landfill, **8** share the following characteristics: (1) large volume and heterogeneity of waste which make treatment impractical; (2) limited number of alternatives for controlling releases; (3) similar potential threats to human health and the environment resulting from leachate generation, soil contamination, landfill contents, landfill gases, and contamination of ground water, surface water, sediments and adjacent wetlands; and (4) the nature of waste deposition. See generally "Presumptive Remedy for CERCLA Municipal Landfill Sites," OSWER Dir. No. 935S.0-49FS, September, 1993. Because the Tulalip Landfill shares these characteristics with municipal landfills, EPA has concluded that the presumptive remedy approach is appropriate for the Tulalip Landfill.

The streamlined approach that EPA has adopted at this Site is consistent with CERCLA, the NCP, and EPA guidance on presumptive remedies. One important principle throughout the RI/FS and remedy selection provisions in the NCP is the "bias for action." EPA emphasized the "bias for action" in the NCF partly in response to criticisms that the Superfund program was too slow, too costly, and unpredictable. At 40 C.F.R. Section 300.430(a)(1), the NCP states: "Remedial actions are to be implemented as soon as site data and information make it possible to do so." At 40 C.F.R. Section 300.430(a)(1)(ii), the NCP states:

> "EPA generally shall consider the following general principles of program management during the remedial process:
>
> (A) Sites should generally be remediated in operable units when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis and response is necessary or appropriate given the size or complexity of the site, or to expedite the completion of total site cleanup."

In the case of Tulalip Landfill, EPA believes an early, interim remedial action is necessary and appropriate to achieve significant risk reduction quickly. Because of the size and complexity of the site, the RI/FS Work Plan was structured to describe a phased analysis of the on-source and off-source areas. Based on the results of the RI/FS, the completed Streamlined Risk Assessment (see Section 6.0 - Description of Site Risks), and public comments received on the Proposed Plan, a phased response (i.e., early implementation of source control) is appropriate while analysis of the wetlands surrounding the landfill continues. Early implementation of source control will expedite the completion of total site cleanup because it will stem the flow of contaminants onto the off-source wetlands, thereby eliminating chemical discharges to the wetlands that exceed comparison numbers, and reducing total chemical loading from the site to the wetlands surrounding the landfill. Early source control may help the wetlands around the landfill recover naturally from site discharges more quickly.

The "bias for action" generally involves a balancing process, i.e., deciding how to balance the need for prompt, early actions against the need for definitive site characterization. This balancing process is specifically linked to the RI/FS, including the risk assessment, at 40 C.F.R. Section 300.430(a)(2):

> "Developing and conducting an RI/FS generally includes the following activities: project scoping, data collection, risk assessment, treatability studies, and analysis of alternatives. The scope and timing of these activities should be tailored to the nature and complexity of the problem and the response alternatives being considered."

The streamlined baseline risk assessment that has been completed for the source area of the Tulalip Landfill Site reflects the nature and complexity of the problem and the response alternatives being considered.

8 While EPA considers the Tulalip Landfill to be a solid waste landfill but not a municipal landfill, EPA believes that using the municipal presumptive remedy guidance at the Tulalip Landfill is appropriate.

The EPA guidance document "Presumptive Remedy for CERCLA Municipal Landfill Sites (September 1993)" **9** states:

> "As a matter of policy, for the source area of municipal landfills, a quantitative risk assessment that considers all chemicals, their Potential additive effects, etc., is not necessary to establish a basis for action if ground water data are available to demonstrate that contaminants clearly exceed established standards or if other conditions exist that provide a clear justification for action."
>
> * * *

"Almost every municipal landfill site has some characteristic that may require additional study, such as leachate discharge to a wetland or significant surface water run-off caused by drainage problems. These migration pathways, as well as ground-water contamination that has migrated away from the source, generally will require characterization and a more comprehensive risk assessment to determine whether action is warranted beyond the source area and, if so, the type of action that is appropriate." (underlining added).

9 In the preamble to the 1990 NCP, EPA stated that it was in the process of developing guidance on expected remedies for specific types of sites (e.g., municipal landfills) and specific types of waste (e.g., PCBs) that will assist in streamlining decision-making and promoting greater efficiency. See 55 Fed. Reg. at 8725.

The approach EPA has adopted for this site is wholly consistent with this guidance. EPA is in the process of developing a more comprehensive risk assessment which focuses on the wetland areas surrounding the landfill. The comprehensive risk assessment will be used to determine whether additional remedial action is warranted in the wetlands, and if so, to support EPA's decision regarding the type of action that is appropriate.

The Proposed Plan identified EPA's preferred alternative for containing the landfill wastes through an Interim Remedial Action by installing a low permeability cover over the waste. Consistent with the program management principles of the NCP Section 300.430(a) and the presumptive remedy guidance, EPA proposed to proceed with an early action to contain the landfill wastes, in this case with an early interim remedial action operable unit. (An operable unit is a portion of a Superfund site; in this case, it refers to the source area of the landfill). EPA plans to initiate design and construction of the containment remedy, in 1996.

The Feasibility Study (FS) for Tulalip Landfill is being conducted by the Respondents in two parts; the first part, called the Source Area Containment Feasibility Study, evaluates various containment alternatives for the landfill source area. **10** The final Source Area Containment Feasibility Study was submitted to EPA on May 4, 1995. The second part, called the Site F~, may be completed in summer, 1996. The purpose of the Site FS is to identify and evaluate additional measures that could be taken to clean up the wetlands and tidal channels that surround the source area. **11**

The Streamlined Risk Assessment that has been completed by EPA is sufficient for the purpose of selecting a containment solution as an interim remedy. EPA's decision that an interim remedial action is appropriate at this time based on current information is consistent with CERCLA, the NCP, and EPA guidance.

This in an interim remedial action ROD. Any remedial action for the area surrounding the landfill, or additional remedial action for the source area, will be specified in the final Site ROD. In preparation of a final remedial decision for the wetlands surrounding the landfill (i.e., the "off-source" area), EPA plans to complete the comprehensive baseline risk assessment, evaluate the Site FS for the off-source area, and consider the results of the source area containment remedy. The selected interim remedy would be compatible with any possible future cleanup actions at the Site, since it is expected to minimize the potential for generation and migration of new leachate to these off-source areas. EPA also expects to work closely with the federal, tribal, and state natural resource trustees in evaluating the appropriate response for the wetlands, sediments, and other off-source resources. A review will be conducted no less often than every five years after commencement of remedial action to ensure that the interim remedy continues to provide

The final RI Report (May, 1995) is available for public review in the Administrative Record for this early/interim remedial action. Adequate protection of human health and the environment. Because this is an interim action ROD, review of this Site and this remedy will be ongoing as EPA continues to develop final remedial alternatives for the off-source area. If EPA's review indicates that the interim action is not providing adequate protection, additional containment action, such as implementation of a perimeter leachate seep collection and treatment system, may be necessary.

10 The source area of the landfill is considered to include approximately 147 acres of waste and the surrounding perimeter landfill berm. The off-source area is considered to include any part of the Site that is located outside the perimeter berm. Figure 1-2 clearly shows the location of the perimeter berm.

11 As a point of clarification, EPA notes that although the phased, presumptive remedy approach has led to two separate FS reports (the SAC FS and the Site FS), and two separate risk assessments (the streamlined baseline risk assessment for the on-source area, and the comprehensive baseline risk assessment for the off-source area), there is only one RI Report for the Site.

5.0 SUMMARY OF SITE CHARACTERISTICS

Three to four million tons of mixed commercial and industrial waste was placed at the Tulalip Landfill between 1964 and 1979. Figure 5-1 is a map of the Site that shows the thickness of the waste across the landfill. This waste is the source of contamination at the Site. Although no records detail the exact types of waste buried at-Tulalip Landfill, investigations indicate that most of the waste is commercial or trade waste, including lumber, newspapers, cardboard, plastic bags, rubber tires, scrap metal, glass, cloth, sawdust, and cobbles. Although logs were banned from further disposal at the Site in 1970, some logs have been identified in the fill in addition to demolition debris and small boulders. other waste in the landfill includes: dredge spoils from at least one shipping terminal project, hospital wastes, waste and still bottoms from the manufacture of artificial vanillin, and small, incidental amounts of municipal wastes. These types of wastes contain a wide variety of hazardous substances that vary in toxicity, mobility, and carcinogenicity. During the late 1980's, approximately 225,000 tons **12** of additional materials was placed on the surface of the landfill as part of a project to construct a more effective landfill cover.

Data collected at the Site, including data from the Remedial Investigation, shows that contaminants are migrating from the waste mass into the surrounding environment. People, animals, and plants are potentially exposed to these contaminants.

12 See Revised Feasibility Study for Source Area Containment (SAC-4), May 4, 1995, pages 37 and 38.

5.1 GEOLOGY

The landfill is situated on the Snohomish River delta in a Quaternary topographic and structural basin known as the Puget Sound lowland. This lowland consists of a series of ridges and valleys that tend to run north-south, which are the result of repeated sediment deposition and erosion by glaciers and associated glacial processes. The separate mesa-like plateaus of the Puget Sound lowland are altered remnants of a former continuous topographic surface that was dissected by the pre- and post-Vashon erosion and further eroded by contemporary rivers such as the Snohomish River.

Most of the surface and shallow subsurface geologic units present in the landfill vicinity consist of unconsolidated sediment deposited during the Vashon Stage of the Fraser glaciation, which ended 11,000 years ago, or are the result of recent sediment deposition by the Snohomish River and its tributaries. The geologic unit on which the landfill was developed is called the alluvium and estuarine deposits. This geologic unit is the youngest deposit of regional significance in the study area. Other regionally significant geologic units near the landfill, in order of increasing age, include the sandy recessional outwash deposits; till consisting of an unsorted mixture of clay, silt, sand, and gravel; advance outwash consisting of layered sand overlain by sandy gravels; and transitional beds which consist mostly of thick beds of clay, silt, and fine sand.

Figure 5-2 is a general north-south cross section diagram of the landfill that shows the stratigraphic units or zones that have been identified at the Site. There are five of these:

- cover material which consists of 1 to 11.5 feet of primarily sandy silt placed over the refuse during closure;
- the refuse, ranging in thickness from 6 to 35 feet;
- a discontinuous silt layer with a thickness of 0 to 10 feet which underlies the refuse throughout much of the landfill;
- "Zone 2", which consists of a silty sand layer ranging in thickness from 15 to 22 feet; and
- "Deeper Zone" which consists of sand, silty sand, and clay and estuarine deposits.

Two of these units, the cover material and the refuse, exist at the Site as a result of the landfilling activities, while the other three units, the silt layer, Zone 2, and Deeper Zone, are site-specific subunits of the alluvium and estuarine deposits. The cover material, the refuse layer, Zone 2, and the Deeper Zone are relatively permeable layers; water is able to move through them. The silt layer is of relatively low permeability, but site studies show that the silt layer is not continuous. In addition to natural breaks shown in Figure 5-2, the man-made barge canals penetrate the silt layer.

5.2 HYDROGEOLOGY

Figure 5-3 shows a conceptual hydrologic model of the Site, which illustrates current understanding of

how contaminants migrate from the landfill to the surrounding environment. When precipitation falls on the landfill, most of the rain water infiltrates down through the cover soil and sinks down into the refuse layer, picking up contamination from the waste as it moves. over the years, a large mound of this contaminated ground water, or leachate, has accumulated within the refuse layer. In Figure 5-3, this leachate mound is described as the "Zone 1" aquifer. The leachate mound within the waste ranges in height from approximately 11 to 16 feet above mean sea level (MSL) which corresponds to a saturated refuse thickness of 14 to 26 feet. The amount of leachate in Zone 1 fluctuates seasonally; in winter months when there is more precipitation, and infiltration into the landfill exceeds the discharge rate, the height of the leachate mound tends to rise within the waste; in the drier summer months when the infiltration rate falls below the discharge rate, the height of the leachate mound tends to fall.

The results of the RI indicate that the leachate mound is not affected by tidal fluctuations of the surface water surrounding the landfill (ie., the height of the leachate mound is unaffected by tidal action). The mean high tidal water level in the landfill vicinity is about 4 feet above MSL, and the mean low tidal water level is about 3 feet below MSL. The highest tide level ever recorded in the area was about 8.5 feet above MSL, and the lowest was about 9.5 feet below MSL. The wetlands surrounding the landfill range between approximately 3 to 6 feet above MSL, so during a high tide the water can submerge the lower part of the landfill berm. The surface water surrounding the landfill contains high levels of salt compared to the freshwater nature of the leachate mound, which suggests that if any surface water surrounding the landfill infiltrates the landfill waste due to tidal fluctuations, such infiltration is minimal. EPA is unaware of any flood events that have submerged the landfill surface.

The leachate in Zone 1 discharges to the wetlands and sloughs surrounding the landfill, carrying contaminants from the landfill with it. Some of this leachate, between approximately 5% to 35% of the total, discharges through the perimeter landfill berm onto wetlands surrounding the Site, and can be visually observed exiting the external face of the berm as "leachate seeps." There are numerous leachate seeps around the landfill perimeter, some of which are transient in nature. The remainder of the Zone 1 leachate, estimated at about 65% to 95% of the total, is driven downward by the weight of the leachate mound through holes in the silt layer, and through the silt layer itself, into the Zone 2 aquifer beneath the landfill. Figure 5-4 is a map that shows the average potentiometric surface in Zone 2 over a 72-hour period in March, 1994. The potentiometric surface of the Zone 2 aquifer shown in this figure suggests that the leachate mound within the landfill exerts pressure on the Zone 2 aquifer, indicating that leachate is being driven down through the silt layer or through gaps in the silt layer, into Zone 2 and outward away from the landfill. The RI indicates that this Zone 2 leachate migrates beneath the perimeter berm and discharges to surrounding surface waters, principally into Ebey Slough to the north and Steamboat Slough to the south. On an annual basis, the perimeter seeps contribute between approximately 5.3 million gallons to 13.1 million gallons per year to the surrounding environment, and the leachate contribution through Zone 2 is between approximately 21 million and 175 million gallons per year.

5.3 SITE DATA

This section briefly summarizes the sampling of on-source and off-source media that has been performed at the Site, and lists the most frequently detected chemicals that were found in each media. For purposes of discussion in this interim ROD, examples of Site sampling "media" include: surface water, Zone 1 ground water, Zone 2 ground water, Deeper Zone ground water, leachate seeps, surface soil, subsurface soil, surface sediment, and fish tissue). "On-source" data refers to chemical data collected from the landfill source area, which includes the landfill surface and contents, the surrounding perimeter landfill berm, and ground water within and beneath the waste. "Off- source" data refers to chemical data collected in the wetland areas and tributaries adjacent to the berm and bounded by Ebey and Steamboat Sloughs (leachate exiting the exterior face of the perimeter berm is considered to be off-source).

5.3.1 On-Source Data

Sample data collected in on-source media (surface water and surface soil;**13** Zone 1, Zone 2, and Deeper Zone groundwater; and surface water) are briefly described below.

Surface Water: During the 1988 Site Investigation, water samples were collected from five pooled surface water locations on the landfill. The following chemicals were detected in 50% or more of these surface water samples: **14** acetone, naphthalene, aluminum, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, and zinc."

13 Because the on-source surface water and on-source surface soil data was taken in 1988, prior to the RI, it may not be representative of current landfill conditions. EPA has considered the 1988 data but has not relied upon it to support any conclusions in this interim ROD. EPA's consideration of these data has not changed EPA's conclusions in this interim ROD.

14 In other words, acetone was detected in at least 50% of all on-source surface water samples; naphthalene was detected in at least 50% of all on-source surface water samples, etc.

Leachate seep SP-01 is a seep that originates on the landfill surface, above the berm, and discharges off the berm into the surrounding wetlands. In addition to the pooled water samples, data from this seep is considered to be on-source surface water data. Detection frequency information for this seep is summarized below, as part of the detection frequency summary of all of the leachate seeps.

Surface Soil: Surface soil samples were also collected at these five sample locations during the 1988 Site Investigation. Some chemicals were detected in these samples. However, none of the chemicals in the analysis were found in more than 50% of all the samples that were taken.

Zone 1 Groundwater: Groundwater was sampled from Zone 1, which is the leachate mound located in the refuse layer, at four well locations. These wells were each sampled once near the beginning of the RI. Chemicals that were detected in 50% or more of all the samples taken from the Zone 1 wells include volatile organic compounds (benzene, 2-hexanone, toluene, chlorobenzene, ethylbenzene, total xylene, 1,3-dichlorobenzene, 1,4-dicholorobenzene); semi-volatile organic compounds (2,4-dimethylphenol, naphthalene, 2-methylnaphthalene, acenaphthene, dibenzofuran, diethylphthalate, fluorene, phenanthrene, anthracene, retene); the semi-volatile indicator compound dehydroabietic acid; pesticides (gamma-BHC [Lindane], heptachlor epoxide); total metals (aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, sodium, zinc); and total cyanide, ammonia nitrogen, and total phenol.

Zone 2 Groundwater: Groundwater was sampled from Zone 2, which is located below the refuse layer, at 24 well locations. Six sampling rounds were conducted for Zone 2 wells located on landfill perimeter berm, one round every other month, over a 12-month period during the RI. Zone 2 wells located in the landfill interior were sampled just once during the first sampling round. Chemicals that were detected in 50% or more of all the samples taken from the Zone 2-wells include the semi-volatile compound bis(2-ethylhexyl)phthalate; total metals (aluminum, barium, calcium, chromium, iron, magnesium, manganese, potassium, sodium, vanadium); and ammonia nitrogen and total phenol.

Deeper Zone Groundwater: Deposits beneath the Zone 2 consist of sand, silty sand, and clay and are referred to as the Deeper Zone. Two monitoring wells were installed in the deeper Zone, and one sample was taken from each of these wells during the first sampling round. Chemicals that were detected in 50% or more of the samples taken from the deeper zone wells include volatile organic compounds (acetone, chloroform, 2-butanone, toluene, total xylene); the semi-volatile organic compound diethylphthalate, the semi-volatile indicator compound dehydroabietic acid; total metals (barium, cadmium, calcium, iron, magnesium, manganese, potassium, selenium, sodium, zinc); and total cyanide, ammonia nitrogen, and total phenol.

5.3.2 Off-Source Data

Sample data collected in off-source media (surface and subsurface soil, surface and subsurface sediment, surface water, and leachate seeps) are briefly summarized below:

Surface Soil: Surface soil was sampled from grids extending into the wetlands around leachate seeps and from fifteen locations in the high estuarine wetlands and salt marshes located immediately west of the landfill. In all, 106 off-source soil samples were taken, including 5 replicate samples collected by the Respondents and 10 duplicate samples taken by EPA.

Chemicals that were detected in 50% or more of all the soil samples taken by the Respondents from the high estuarine wetlands, which are located just off the western boundary of the landfill, include the semi-volatile organic compound indicator dehydroabietic acid; polynuclear aromatic hydrocarbons (phenanthrene, fluoranthene); total metals (aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium, zinc); and total cyanide.

Chemicals that were detected in 50% or more of all the soil samples taken by the Respondents near the leachate seeps include semi-volatile organic compounds (phenanthrene, fluoranthene, pyrene, chrysene, benzo(b)fluoranthene); the semi-volatile indicator compound dehydroabietic acid; polynuclear aromatic hydrocarbons (phenanthrene, fluoranthene); and total metals, aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium, zinc).

Subsurface Soil: Subsurface soil was sampled near six of the leachate seeps along the edges of the landfill. Samples were taken at 6-inch intervals to a depth of 2 feet. In all, 20 off-source subsurface soil samples were taken, including two duplicate samples collected by EPA. Chemicals that were detected In 50% or more of all the subsurface soil samples taken by the Respondents include semivolatile organic compounds (1,4-dichlorobenzene, 2-methylnaphthalene, acenaphthene, dibenzofuran, carbazole, pyrene, chrysene,

bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene); the semi-volatile indicator compound dehydroabietic acid; polynuclear aromatic hydrocarbons (naphthalene, fluorine, phenanthrene, anthracene, fluoranthene, pyrene); the pesticide gamma-BHC (Lindane); the polychlorinated biphenyl ("PCB") Aroclor-1242; and total metals (aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium, zinc).

Surface Sediment: Surface sediment was sampled at 46 locations around the landfill. In all, 52 samples were taken, including six duplicate samples collected by EPA. Chemicals that were detected in 50% or more of off-source surface sediment samples taken by the Respondents include: 4-Methylphenol, phenol, phenanthrene, fluoranthene, pyrene, chrysene, benzo(a)pyrene, aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, sodium, vanadium, and zinc.

Subsurface Sediment: Subsurface sediment was sampled at six of the sediment sampling locations. Samples were taken at 6-inch intervals to a depth of 2.0 feet. In all, 20 samples were taken, including two duplicate samples collected by EPA. Chemicals that were detected in 50% or more of all the off-source subsurface sediment samples taken by the Respondents include 2-Methylnapthalene, 4-methylphenol, dibenzofuran, napthalene, acenaphthylene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc.

Surface Water: Surface water was sampled at 18 locations around the landfill. Twenty samples were taken, including two duplicate samples collected by EPA. Chemicals that were detected in 50% or more of all the surface water samples taken by the Respondents include the following total metals: aluminum, barium, calcium, and iron.**15**

Leachate Seeps: Leachate was sampled at 10 off-source around the landfill (leachate seeps SP02 through SP11) and one on-source location (SP01). With the exception of leachate seep SPOl, in general, leachate seep samples were taken at the point where leachate exited the perimeter landfill berm before discharging onto the wetlands surrounding the Site. Six sampling rounds were conducted during the RI, one every other month, for a year. Fifty-five samples were taken, including seven duplicate samples collected by EPA. Chemicals that were detected in 50% or more of leachate samples taken by Respondents during rounds 1 through 5 **16** include volatile organic compounds (benzene, chlorobenzene, total xylene, 1,4-dichlorobenzene); 8emi-volatile organic compounds (2,4-dimethylphenol, naphthalene, 2-methylnaphthalene, acenaphthene, dibenzofuran, fluorine, phenanthrene, retene); the semi-volatile indicator compound dehydroabietic acid; total metals (aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, nickel, sodium, vanadium, zinc); ammonia nitrogen and total phenol. **17**

Fish Tissue: Twenty-four composite fish tissue samples were taken from tidal channels surrounding the landfill. Some of the chemicals that were detected in 50% or more of all the fish tissue samples include PCB Aroclor-1254, mercury, arsenic, chromium, and vanadium.

15 Lead, which exceeded Ambient water Quality Criteria at one off-source surface water location, was detected in 40% of all off-source surface water samples.

16 The source of this summary of the leachate seep data is Remedial Investigation Table 4-20, entitled "Summary of Leachate Seep Water Analytical Results for Rounds 1 through 5. Apparently, leachate data from the sixth round was not yet available for inclusion in this Table.

17 In many of the water media, dissolved metals were also detected in addition to total metals. In the leachate seep samples, for example, dissolved metals that were found in 50% or more of all the samples include aluminum, antimony, arsenic, barium, cadmium, calcium, chromium, iron, magnesium, manganese, potassium, nickel, sodium, and zinc for Interim Remedial Action (the "Streamlined Risk Assessment") include ingestion of on-source and off-source soil, ingestion of fish or shellfish that have contacted leachate, ingestion of fish or shellfish in surface water near the Site, and ingestion of off-source sediment.

5.4 EXPOSURE PATHWAYS

The results of Site studies indicate that contaminants are migrating from the landfill to the surrounding environment. Table 5-1 lists chemicals that have been found in various on-source and off-source media. The high number of chemicals that are common across different media, in combination with information that has been learned about the Site geology and hydrogeology, indicates that water infiltrating the waste mobilizes chemicals in the waste, and then transports them off site via the perimeter leachate seeps and Zone 2 ground water. These chemicals from the landfill have subsequently accumulated in off-source media including surface soil, subsurface soil, surface sediment, subsurface sediment, and fish tissue. Page 6-6 of the RI concludes that surface soil chemical concentrations were highest nearest the seeps discharge points and lower further from the seeps, which suggests that chemicals migrating from the landfill are likely causing elevated chemical concentrations in off-source areas.

There are many potential routes, or pathways, by which exposure to landfill contaminants can occur. Figure 5-5 shows a Human Health Conceptual Site Model, which describes the potential pathways for human exposure to Site contaminants. Potential pathways evaluated in the streamlined baseline Risk Assessment

Figure 5-6 is an Ecological Conceptual Site Model, which shows the potential exposure pathways for ecological receptors including animals and plants. Potential pathways for ecological receptors evaluated in the Streamlined Risk Assessment include plant and subsequent bird and mammal uptake of contaminants in off-source and on-source soil; invertebrates and fish uptake associated with leachate, off-source and on-source surface water; and invertebrate uptake associated with off-source sediment. As Figures 5-5 and 5-6 indicate, additional potential exposure pathways for terrestrial and aquatic organisms and humans will be evaluated in a comprehensive baseline risk assessment which EPA has begun to prepare.

People that use the on-source or off-source areas of the Site are potentially exposed to contaminants in or emanating from the landfill. People that could be exposed include current and future recreational users, and future industrial or commercial users.**18** Potentially exposed ecological populations include Plants on or near the site; and animals, including fish, otter, rodents, water fowl, and raptors that use the Site or the wetlands surrounding the Site.

6.0 DESCRIPTION OF SITE RISKS

Using sample data collected from the Site, the U.S. Environmental Protection Agency (EPA) conducted a streamlined baseline risk assessment to evaluate the health and/or environmental problems that would result if the contamination is not addressed. This qualitative analysis, called the Tulalip Landfill Risk Assessment for Interim Remedial Action, August, 1995 **19** (the "Streamlined Risk Assessment"), has been prepared in accordance with the National Contingency Plan (NCP) and EPA guidances on risk assessments and presumptive remedies."

18 Light industrial or commercial use is consistent with potential future land uses as identified by the Tulalip Tribes (see "Big Flats Land Use Program", Tulalip Tribes of Washington, July 10, 1994, in the administrative record).

19 The Tulalip Landfill Risk Assessment for Interim Remedial Action is a streamlined baseline risk assessment as described by EPA guidance -- see Streamlining the RI/FS for CERCLA Municipal Landfill Sites (OSWER Directive: 9355.3-11FS, December, 1990, page 3, section entitled "Streamlining the Baseline Risk Assessment." See also the Responsiveness Summary for this ROD.

The preamble to the National Contingency Plan (NCP) and EPA guidance provides information on how EPA suggests risk assessments may be conducted at Superfund sites of varying scope and complexity. The Streamlined Risk Assessment is consistent with the NCP preamble language, which emphasizes a "bias for action" in how to balance the need for prompt, early actions against the need for definitive site characterization. The NCP states:

"EPA expects to take early action at sites where appropriate, and to remediate sites in phases using operable units as early actions to eliminate, reduce or control the hazards posed by a site or to expedite the completion of total site cleanup. In deciding whether to initiate early actions, EPA must balance the desire to definitively characterize site risks and analyze alternative remedial approaches for addressing those threats in great detail with the desire to implement protective measures quickly. Consistent with today's management principles, EPA intends to perform this balancing with a bias for initiating response actions necessary or appropriate to eliminate, reduce, or control hazards posed by a site as early as possible."

* * *

"To implement an early action under remedial authority, an operable unit for which an interim action is appropriate is identified. Data sufficient to support the interim action decision is extracted from the ongoing RI/FS that is underway for the site or final operable unit and an appropriate set of alternatives is evaluated ... A completed baseline risk assessment generally will not be available or necessary to justify an interim action."

* * *

"Qualitative risk information should be organized that demonstrates that the action is necessary to stabilize the site, prevent further degradation, or achieve significant risk reduction quickly." 55 Federal Register 8704 (March 8, 1990) (underlining added).

The Streamlined Risk Assessment was developed in accordance with this language. Consistent with the presumptive remedy guidance for streamlining the RI/FS process, the RI focused on characterizing areas where contaminant migration away from the landfill was suspected.

In compliance with the NCP and EPA guidance, the Streamlined Risk Assessment compares chemical concentrations found in various media (for example: ground water; leachate exiting the landfill; surface soil, water, and leachate on the landfill surface; and sediments and soils adjacent to the landfill) at the Site with what are hereinafter referred to as "comparison numbers".**20** These comparison numbers are established standards and criteria, and calculated risk-based concentrations, that are generally considered to be protective of human health and the environment." These comparison numbers, with the exception of the soil risk-based concentrations, have been established or developed under federal or state laws.

The Streamlined Risk Assessment assumes a commercial/industrial future use exposure scenario because this is consistent with the Future Land Use Plan" that the Tulalip Tribes have developed for the Site. A residential exposure scenario was not used. The Tribes have designated the landfill surface for recreation and possible economic development in the form of commercial or light industrial use, and the surrounding wetlands are designated for preservation as wetlands for traditional hunting and fishing.

In addition to the completed Streamlined Risk Assessment, EPA is currently preparing a comprehensive baseline risk assessment for the off-source area of the Site. This comprehensive baseline risk assessment will support decisions on the need for response actions in the off-source area.

20 After evaluating public comments on the Proposed Plan, it is apparent to EPA that some commentors were misled by EPA's use of the phrase "screening criteria" in the Streamlined Risk Assessment to refer to standards, criteria, and risk-based concentrations used in the streamlined Risk Assessment. To clarify this issue, EPA is using the more accurate phrase "comparison numbers" to refer to these standards, criteria, and risk-based concentration. EPA notes that these comparison numbers have been selected for use in the Streamlined Risk Assessment for the purpose of evaluating potential risks posed by the Site. These comparison numbers are not necessarily ARARs.

21 Water quality standards and criteria are not necessarily protective of wildlife or benthic organisms. EPA has been evaluating how to produce water quality criteria that are protective of wildlife. The salient issues in EPA's effort include evaluating bioaccumulation (from all routes of exposure; food, sediment, water, etc.), bioconcentration (usually just through exposure to water), and biomagnification (increasing tissue concentrations with hierarchy in the food web). Some of the first contaminants to be evaluated in this manner include mercury and DDT, two contaminants that are discharging from the Site. Water quality standards and criteria may be made more stringent in the future to address these concerns (EPA notes, however, that ARARs for this interim remedial action are frozen when this interim ROD is signed).

22 Big Flats Land Use Program, Tulalip Landfill Remedial Investigation and Feasibility Study (July 10, 1994).

6.1 HUMAN HEALTH EVALUATION

The human health evaluation in the Streamlined Risk Assessment selects comparison numbers that represent concentration levels that are considered to be protective of people using the site for commercial/industrial purposes, and then compares site-specific analytical data to these comparison numbers. In general, comparison numbers include established standards, criteria, and risk-based concentrations. Various media on and adjacent to the landfill, including surface water, ground water, surface soil, subsurface soil, leachate seeps, surface sediment, and subsurface sediment, were sampled during the Remedial Investigation. The Streamlined

Risk Assessment compares the sample results from these media to the comparison numbers, and exceedences of the comparison numbers are summarized and reported.

Human health comparison numbers for soils and sediments were derived from two sources. A commercial/industrial scenario was assumed for selection of soil and sediment comparison numbers comparison numbers for a recreational scenario were unavailable). For each chemical, the lower of the two values derived from the following sources was selected:

- EPA Region 3 risk-based concentration tables for industrial exposures;
- Model Toxics Control Act (MTCA) Method C values for industrial/commercial exposures (Chapter 173-340-740 Washington Administrative Code, Washington Department of Ecology, 1995)

The Region 3 risk-based concentrations have been developed by EPA using Risk Assessment Guidance for Superfund (EPA, 1989) algorithms and toxicity information contained in both EPA's Integrated Risk Information System (IRIS) database and Health Effects Assessment Summary Tables (HEAST). Region 3 updates these concentrations on a quarterly basis. The Region 3 risk-based concentrations are considered to be protective of the ingestion pathway, but are not considered to be protective of other potential exposure routes such as inhalation, nor would they be expected to prevent contaminant migration, such as contaminants leaching from soil to ground water or surface water.

For surface water, leachate, and ground water that discharges to surface water, comparison numbers were calculated based on the indirect pathway of ingestion of seafood harvested from surface water near the landfill, using:

- EPA Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants; States Compliance Final Rule (EPA, 1992).

The comparison numbers were calculated based on a 1x10-6 cancer risk, assuming consumption of 6.5 gm of fish per person per day. This consumption rate was based on a national average; however, this rate is likely below the fish consumption rate of Tulalip Tribal members. A more realistic (i.e., higher) exposure consumption rate for Tribal members will be developed and used in the comprehensive baseline risk assessment for the Site FS, which will evaluate the need for additional response actions for the off-source area. Human health comparison numbers for specific contaminants in specific media are provided in Table 6-1.

Site-specific data were evaluated against the comparison numbers. Chemicals that exceed the human health comparison numbers were found in leachate exiting the perimeter landfill berm through the leachate seeps, off-source surface sediments, off-source subsurface sediments, off-source surface soils, and off-source surface water in the tidal channels near leachate seeps. Results of the comparison of Site data to human health comparison numbers are shown in Table 6-2. This table includes information on the frequency of exceedences in each medium.

Chemicals found in the leachate discharging from the perimeter berm through the leachate seeps that were measured at levels at least an order of magnitude (ten times) higher than the human health comparison numbers include 4,4'-DDT, 4,4'-DDD, 4,4'DDE, aldrin, Aroclor-1016, Aroclor-1232, Aroclor-1254, arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dieldrin, indeno(1,2,3-cd)pyrene, heptachlor, and heptachlor epoxide.

Chemicals exceeding the comparison numbers in soils and sediments adjacent to the landfill surface include Aroclor 1242 and Aroclor 1248, arsenic, beryllium, heptachlor epoxide, and polycyclic aromatic hydrocarbons (PAHs). Of these, arsenic had the highest frequency of exceedance (98 to 100 percent in soil and sediment samples taken adjacent to the surface of the landfill).

The RI/FS approach for evaluating Zone 2 ground water was to measure ground water chemical concentrations at 13 perimeter landfill berm wells. Based on this data from the berm wells, the Respondents used a ground water modeling technique to predict the degree of contaminant dilution that would be expected between the berm wells and the location where Zone 2 ground water enters the sloughs, which is where sediment-dwelling organisms would be impacted and, according to State law, is where State water quality standards must be applied. The results of the Respondents' ground water modeling indicated that, in general, one would expect contaminants in the berm wells to be diluted by a factor of 5 to 9 by the time they reached the sloughs. This of average concentrations would result primarily from the contaminated ground water measured at the berms becoming diluted from mixing with cleaner, uncontaminated ground water as it moved toward the sloughs.

Assuming a concentration reduction at the low end of the range predicted by the modeling, 5 times, arsenic would be expected to exceed the human health comparison numbers at the location where Zone 2 ground water enters the sloughs:

Chemical	Frequency of Exceedances
Arsenic - total	17/73
Arsenic - dissolved	3/26

Assuming a concentration reduction at the high end of the range predicted by the modeling, 9 times, arsenic still exceeds the comparison numbers at the same frequency at the location where Zone 2 ground water enters the sloughs:

Chemical	Frequency of Exceedances
Arsenic - total	17/73
Arsenic - dissolved	3/26

Based on this evaluation, and if the concentration reduction factor predicted by the modeling (5 to 9 times) between the berm wells and the Zone 2/slough interface is assumed, **23** arsenic would be expected to exceed the human health comparison numbers at the location where Zone 2 discharges to surface water.

Figure 6-1 is a map of the Site that shows sampling locations of the most significant site data exceedences of the human health comparison numbers. Sample data at the locations shown in this Figure exceed the comparison numbers by at least an order of magnitude.

In addition to information regarding chemical contaminants at the Site, EPA presented a summary of microbial data from samples taken over a period of twenty years at and around the Tulalip Site. See Streamlined Risk Assessment Appendix C.

23 EPA believes the Respondents' modeling effort is not sufficiently conservative for a number of reasons. For example, the Respondents' model, a model called Seep-W, assumed that the distance between the Zone 2 perimeter berm wells and the sloughs was 300 feet. However, at some locations at the Site this distance is significantly less than 300 feet (at the old barge canal entrance, for example, the distance between the berm and the slough is 0 feet). Also, it is possible that Zone 2 leachate is surfacing in some of the tidal channels in the wetlands between the landfill berm and the sloughs, for which the model does not account. A more conservative modeling effort that accounted for issues such as these may have resulted in a lower predicted concentration reduction range than that predicted by the Respondents.

Analyses of water samples taken from the Site indicate the presence of opportunistic pathogens that are resistant to antibiotics.

6.2 ECOLOGICAL EVALUATION

The ecological evaluation in the Streamlined Risk Assessment selects or develops comparison numbers that represent concentration levels considered to be protective of ecological receptors, and then compares site-specific data results to the comparison numbers. In general, comparison numbers include established standards, criteria, and risk-based concentrations. Various media on and near the landfill, including surface water, ground water, surface soil, subsurface soil, leachate seeps, surface sediment, and subsurface sediment, were sampled during the Remedial Investigation. The Streamlined Risk Assessment compares these sample results to the comparison numbers, and site data exceedences of the comparison numbers are summarized and reported.

The Streamlined Risk Assessment selects or develops comparison numbers that are considered to be protective of ecological receptors in the vicinity of Tulalip Landfill. Comparison numbers for sediments are equivalent to the Washington State Sediment Management Standards. The sediment comparison numbers are dry-weight normalized Apparent Effects Threshold AET) concentrations which, if normalized for organic carbon, are equivalent to the Sediment Management Standards. AETs are used because Site data were reported on a dry weight basis, and, on a dry-weight basis, AETs are equivalent to the Washington State Sediment Standards (Chapter 173-204 WAC).

For surface water, groundwater, and leachate discharges, the Streamlined Risk Assessment selects comparison numbers that are considered protective of aquatic life. **24** The federal criteria described under the authority of the Clean Water Act (CWA)Section 304(a) are designed to protect all water bodies across the nation. In addition, these or more stringent criteria have been adopted as standards by Washington State.

For a given chemical, the most conservative of the State standard or the federal criterion has been selected as the comparison number. Application of freshwater versus marine comparison numbers is based on the salinity of the receiving water body and the types of plant and animal communities present.

24 Relatively recent changes to the National Toxics Rule were published after development of the Streamlined Risk Assessment. However, these National Toxics Rule changes would not have significantly changed the results of any analyses, and would not have changed any conclusions, in the Streamlined Risk Assessment.

For example, data from on-source pooled water and leachate seep SP-01 were compared to the more stringent of:

- Washington State acute and chronic fresh Water Quality Standards (Ecology, 1992)
- Federal acute and chronic freshwater Ambient Water Quality Criteria (AWQC) (EPA, 1992b)

Data from off-source surface water, groundwater, and perimeter berm leachate seeps discharging directly to off-source wetlands were compared to the-more stringent of:

- Washington State acute and chronic marine Water Quality Standards (Ecology, 1992)
- Federal acute and chronic marine Ambient Water Quality Criteria (AWQC) (EPA, 1992b)

Comparison numbers used in the ecological evaluation for specific contaminants in specific media are provided in Table 6-3.**25**

The Streamlined Risk Assessment compared site data to the comparison numbers. Chemicals-exceed the comparison numbers in samples taken from on-source surface water, on-source soil, Zone 1 groundwater, Zone 2 groundwater, leachate discharging through the perimeter berm leachate seeps, off-source surface soil, off-source subsurface soil, off-source surface water, off-source surface sediment, and off-source subsurface sediment. Tables 6-4 and 6-5 summarize the chemicals found in these on-source and off-source media at the Site that exceed the ecological comparison numbers, and also provide information regarding the frequency of the exceedences.

Chemicals measured at levels at least ten times higher than the ecological comparison numbers include pesticides (4,4'-DDT, heptachlor epoxide, and aldrin), PCBs (Aroclor 1016 and Aroclor 1232), copper, cyanide, endrin, lead, mercury, zinc, nickel, chromium, acenaphthene, naphthalene, fluorene, and 2- methylnaphthalene.

Chemicals found in off-source wetland soils near six of the leachate seeps exceed comparison numbers, and chemicals exceed comparison numbers in subsurface soils at five of the six leachate seeps tested. Chemicals found in leachate exceeded comparison numbers at least once in most of the eleven seeps that were tested. Chemicals exceeding comparison numbers in Zone 1 ground water included total metals (copper, lead, nickel, and zinc), and ammonia nitrogen, total cyanide, and heptachlor epoxide.

25 AWQC calculations in the interim ROD Tables are based on a pH of 7.8 and hardness of 100 ppm CaC031 which are within ranges that have been measured at the Site.

The RI/FS approach for evaluating Zone 2 ground water was to measure ground water chemical concentrations at 13 perimeter landfill berm monitoring wells. Ground water samples taken directly from the Zone 2 monitoring wells showed that total metals (copper, lead, chromium, and nickel), total cyanide, and ammonia nitrogen exceeded surface water comparison numbers in many of the samples. Based on this data from the berm wells, the Respondents used a ground water modeling technique to predict the degree of contaminants dilution that would be expected between the berm wells and the location where Zone 2 ground water enters the sloughs, which according to State law is where State water quality standards must be applied. The results of the Respondents ground water modeling indicated that, in general, one would expect contaminants in the berm wells to be diluted by a factor of 5 to 9 by the time they reached the sloughs. Assuming a concentration reduction at the low end of the range predicted by the modeling, 5 times, the following contaminants would be expected to exceed the ecological comparison numbers at the location where Zone 2 ground water enters the sloughs:

Chemical	Frequency of Exceedances
Cyanide - total	1/13
Nickel - total	7/73
Nickel - dissolved	2/26
Ammonia Nitrogen	73/73

Assuming-a concentration reduction at the high end of the range predicted by the modeling, 9 times, the following contaminants are predicted to exceed the ecological comparison numbers at the location where Zone 2

ground water enters the sloughs:

Chemical	Frequency of Exceedances
Cyanide-total	1/13
Nickel-total	1/73
Ammonia-nitrogen	73/73

Based on this-evaluation, and if the concentration reduction factor predicted by the modeling (5 to 9 times) between the berm wells and the Zone 2/slough interface is assumed, **26** the contaminants listed above would be expected to exceed the ecological comparison numbers at the location where Zone 2 discharges to surface water.

26 See footnote 19.

Figure 6-2 is a map of the Site that shows sampling locations where the most significant site data exceedences of the ecological comparison numbers occur. Sample data at the locations shown in this Figure exceed the comparison numbers by at least an order of magnitude.

6.3 ASSESSMENT OF SITE

The results of the Streamlined Risk Assessment indicate that there are a significant number of exceedances of human health and ecological comparison numbers in most of the media at the Site. Exceedences were found in leachate, surface water, ground water, soils, and sediments at the Site. These exceedances indicate the potential for adverse effects to people that use the Site, and to animals and plants that live on or near the landfill and come into contact with these media. The RI data establishes a clear link between contamination leaving the landfill and that found in adjacent areas. Many of the chemicals that exceeded comparison numbers in soil and sediment samples taken near the landfill leachate seeps were also detected in leachate seeping from the landfill surface and berm. EPA does not consider ecological risks as having adverse implications only for the environment. Ecological risks also impact human health.

Site data that exceed the chemical comparison numbers, which are considered to be protective of plants, mammals, and aquatic organisms, indicate that many plants and organisms may be at risk from exposure to hazardous substances at the Site. See Streamlined Risk Assessment pages 4-9 and 4-10, and Appendix A. Soil concentrations that are toxic to plant life indicate that the more sensitive plant species, and animals such as field mice and waterfowl that feed on them, may be adversely affected. Increased mortality to plants also indicates that the natural cycle of nutrients within the wetland may be altered. Such exceedances may present threats not only to these types of plants and organisms but also animal predators higher on the food chain, such as hawks, eagles, and salmon. Some chemicals, such as DDT and PCBs, tend to increase in concentration as they move up the food chain, and may represent higher risks for predators. For example, shrews may become contaminated from ingesting earthworms that live in contaminated soils. If field mice and shrews die as a result of the contamination, then predators lose them as a food source. If the field mice and shrews accumulate contaminants but don't die, their predators may be at risk from elevated contaminant concentrations in their food supply.

The presence of these chemicals at concentrations above the comparison numbers indicates that there are releases of hazardous substances that pose actual or potential threats to animal and plant life in the wetland areas around Tulalip Landfill. In addition, data collected during the RI show the presence of chemicals of concern (for example, cadmium, chromium, and nickel) in sculpin (a species of fish) found in the tributaries surrounding the Site. Wetlands are considered sensitive habitats and are protected under the Clean Water Act. They have attained national recognition as critical areas for important ecological functions such as avian roosting, feeding, and breeding; fish and invertebrate nurseries; nutrient import and export; flood control; and sediment trapping. Wetland areas serve as critical habitat to animals during the sensitive life-stages of reproduction and rearing. Many kinds of birds such as waterfowl, shorebirds, eagles and falcons use the wetland areas surrounding Tulalip Landfill for feeding and rearing of young. (Estuarine and marine fish and invertebrate species use wetland areas for reproduction and rearing of juveniles; therefore, more sensitive life-stages are likely to be present during certain periods of the year). It is important to ensure these sensitive life-stages are protected from stress in the form of chemical contamination or deterioration of habitat quality.

In addition to the importance of protecting the estuary wetlands from potentially harmful concentrations of chemicals that exceed the comparison numbers, it is also important to reduce the total loading of contaminants from the landfill to the estuary. When contaminants leave the landfill they enter the nearby ecosystems which include wetlands and sloughs. Contaminants in the leachate seeps (accounting for approximately 5-35% of the leachate leaving the landfill) are also found in the media surrounding the landfill, strongly indicating a transport pathway from the landfill to the nearby ecosystems. The strongest

indication of movement of bioaccumulative contaminants from the seeps to surrounding media comes from leachate seep locations SP08 (for DDT) and SP09 (for PCBs).

Similarly, contaminants found in the ground water within the landfill are most likely moving with the ground water into the surrounding ecosystems (estimated as about 65% to 95% of the total, leachate transport). Like the leachate seep contaminants, these ground water contaminants can accumulate in sediments as the ground water contacts the nearby surface waters (tributaries, tidal creeks, and the sloughs). Based on the exceedances of comparison numbers in Zone 2 ground water in the berm wells and predicted through ground water modeling at the sloughs, it is appropriate to conclude that discharges from the landfill are resulting in exceedances of human health and ecological comparison numbers at the location where Zone 2 ground water discharges to surface water, which represents a potential threat to human health and the environment.

Based on the RI ground water modeling, chemicals of concern at the location where Zone 2 ground water discharges to the sloughs include arsenic (for human health); and cyanide, nickel, and ammonia (for ecological receptors). EPA notes that ammonia nitrogen (i.e., ammonia) exceeds comparison numbers in all samples taken at the high end of the predicted concentration reduction range (73 of 73). Based on the loading rate estimates provided in RI Table 5-14, the yearly discharge rate of ammonia from the entire Site would be approximately 2971 lbs., or about 1.5 tons. Approximately 65% to 95% of the total leachate at the Site discharges through Zone 2, so the contribution from the Zone 2 wells would be in range of 1931 lbs. to 2822 lbs. (1 to 1.5 tons; per year.

Although dilution of dissolved or suspended material and contaminants will undoubtedly occur as leachate or ground water moves away from the landfill, there is significant potential for several classes of contaminants to associate with organic material and other particles, accumulate in sediments, and become incorporated into the food webs in the ecosystems surrounding the landfill. Of particular concern, because of extremely well-documented information elsewhere, are persistent and bioaccumulative contaminants such as DDT (and other historical pesticides), PCBs, and metals.

The predicted toxicity of contaminants in the leachate seeps and groundwater has been evaluated using standard approaches (comparison with available standards, criteria, risk-based levels, etc.). Existing data show clear indications of toxicity from landfill sources. At leachate seeps in particular, DDT and two PCB Aroclors (1016 and 1232) had exceedences of 13-49, 16-40, and 33-194 times the ecological water quality criterion, respectively. These consistent, high level exceedences underscore the concern that the leachate seeps represent an ongoing source that loads these persistent and bioaccumulative contaminants into the surrounding ecosystems. Of similar concern is mercury, which had concentrations in the leachate up to 15 times the water quality criterion. Even though these concentrations are likely to decrease with distance from the seep source, constant loadings could maintain the presence of these compounds in the surrounding off-source media.

One reason the landfill poses a problem for its surroundings is its relatively large size. The landfill perimeter (approximately 5,300 feet) fronts over 2 miles of off-source, ecologically significant wetlands. The landfill contributes a significant amount of leachate to the estuary, estimated between 26.3 to 188.1 million gallons each year.

For information regarding potential limitations regarding the data use and interpretation, see Streamlined Risk Assessment Section 4.6 - Uncertainty Analysis. Samples taken for the Remedial Investigation show that "reference" wetland areas located a short distance from the landfill have elevated levels of man-made chemicals. EPA's interpretation of these results is that this contamination in off-Site reference areas suggests that the wetlands and sloughs in the vicinity of the landfill are already at risk from contaminant loading, from sources that may include the landfill. Based on information gathered by EPA over the years at the Site, it is reasonable to conclude that the Tulalip Landfill is a chronic source of contamination to the surrounding estuary. Containment of the landfill source area is expected to reduce chemical loadings to off-source areas.

The nature and extent of contamination at Tulalip Landfill and the associated potential risks as determined from the Streamlined Risk Assessment require remedial action to be taken at the Site. Comparison of the measured Site chemical concentrations to the human health risk-based and ecological effects-based standards and criteria established under other environmental laws, and risk-based chemical concentrations, reveals significant potential risks to humans and the environment. Based on the RI/FS and findings in the Streamlined Risk Assessment, EPA finds that actual or threatened releases of hazardous substances from the Site, if not addressed by the selected alternative, may present an imminent and substantial endangerment to public health, welfare, or the environment. The qualitative risk information provided in the Streamlined Risk Assessment demonstrates that remedial action is necessary to stabilize the site and to prevent further degradation of off-source areas as a result of chemical discharges from the Site.

Based on the microbial data collected from the Site, EPA concluded in the Streamlined Risk Assessment that "microbial contamination at the site may pose a potential risk to humans."

7.0 CLEANUP OBJECTIVES FOR THE INTERIM REMEDIAL ACTION

Based on the results of the RI and the Streamlined Risk Assessment, the extent of contamination at the Site includes the following:

- the waste placed in the landfill, including part or all of the landfill berm; Zone 2 ground water within the waste mass;
- leachate exiting the berm through seeps and discharging to the wetlands and tidal channels adjacent to the landfill;
- the landfill surface, including surface soils, pooled water on the landfill surface and at least one leachate seep on the landfill surface;
- Zone 2 ground water beneath the waste mass that moves beneath the adjacent wetlands and discharges directly into the sloughs and possibly the tidal channels;
- sediments and soils adjacent to the landfill; and
- fish that live near the landfill.

The purpose of establishing Remedial Action Objectives (RAOs) is to help ensure that the selected remedial action will be protective of human health and the environment by effectively containing waste at the Site and to minimizing exposure of humans and ecological receptors to Site contaminants. The RAOs for the interim remedial action are:

Zone 1 leachate: Eliminate migration of leachate that exceeds surface water ARARs from, through, and under the source area berm;

Soil/landfill contents/source surface water: Prevent direct contact with, and ingestion of, landfill contents, contaminated soils, and contaminated surface water on the landfill surface;

Minimize infiltration: Minimize infiltration into the landfill wastes and resulting contaminant leaching to ground water.

Zone 2 ground water: Minimize migration of contaminated ground water at levels exceeding surface water ARARs, and prevent use of contaminated ground water;

Stormwater runoff and erosion: Prevent detrimental impact to adjacent off-source wetlands and surface water bodies due to stormwater runoff from the landfill cap surface;

Landfill gas: Prevent inhalation and release of landfill gas exceeding ambient air standards established by the Puget Sound Air Pollution Control Authority (PSAPCA). Manage landfill gas to prevent stress on a cap system;

Wetlands: Minimize loss of off-source wetlands, and mitigate for any destruction of or damage to off-source wetlands from the remedial action;

Future land use: Provide final surface conditions suitable for all season subsistence (i.e., hunting and fishing), recreational, and light industrial and commercial use.

The point of compliance for Zone 1 ground water (i.e., the leachate seeps) shall be the point at which leachate exits the exterior face of the perimeter landfill berm. The point of compliance for Zone 2 ground water shall be the location where Zone 2 ground water discharges to surface water.

27 Inclusion of this RAO is recommended by EPA guidance. See Presumptive Remedy for CERCLA Municipal Landfill Sites (EPA 540-F-93-035, September 1993), page 5.

7.1 SUMMARY OF MAJOR APPLICABLE REQUIREMENTS

This section and the following section (Section 7.2) summarize some of the major applicable or relevant and appropriate requirements ("ARARs") that have been identified as part of the analysis of the proposed alternatives. This section summarizes requirements that are "applicable" to the interim remedial action, and Section 7.2 summarizes requirements that are and appropriate." A more detailed discussion and analysis of these and other ARARs, including explanation of why these requirements are applicable or relevant and appropriate, is provided in Section 11.2 of this ROD. However, these ARARs are presented here in summary

fashion in order to assist the reader with the discussions contained in the "Description of Alternatives" and the "Summary of the Comparative Analysis of Alternatives" sections of this interim action ROD. The following requirements are applicable to the interim remedial action:

Section 402 of the Clean Water Act ("CWA") – 33 U.S.C. § 1342

Normally, any sort of action that results in dredging or filling wetlands is governed by Section 404, not 402, of the CWA. However, in November 1984, the U.S. Army Corps of Engineers informed the Tulalip Tribes of the Corps decision that the landfill capping activities that the Tribes were undertaking in the 1980's would fall under the authority of Section 402 of the CWA, not Section 404. Thus, for the on-source area of the landfill, Section 402 is the ARAR under the CWA, not Section 404.

Section 402 of the CWA established the NPDES permit program, which governs direct discharges from point sources. The NPDES permit regulations contain provisions for discharge limitations, monitoring requirements, and best management practices. Because this interim action is being conducted entirely on-site, Section 121 (e) of CERCLA does not require that a NPDES permit be issued to cover these on-site discharges. However, this interim action will meet all substantive requirements of the NPDES permit program for any on-site discharges.

Section 404 of the Clean Water Act -- 33 U.S.C. § 1344

Section 404 of the CWA regulates the discharge of fill material into the waters of the U.S., including wetlands. Section 404 is relevant and appropriate for the off-source areas of the Site. The guidelines for this program are set forth in 33 C.F.R. Parts 320 through 330 and 40 C.F.R. Part 230, and are established to ensure that proposed discharges are evaluated with respect to impacts on aquatic ecosystems.

Clean Air Act (42 U.S.C. §§ 7401 et seq.) -- National Primary and Secondary Ambient Air Quality Standards, 40 C.F.R. Part 50.

These regulations govern emissions of particulates and certain priority pollutants to the air from on-site sources. Remedial actions that would result in air emissions will be designed to meet federal air quality standards.

7.2 SUMMARY OF MAJOR RELEVANT AND APPROPRIATE REQUIREMENTS

The following summarizes some of the major requirements that are relevant and appropriate for the interim remedial action:

Federal Water Pollution Control Act/Clean Water Act
33 U.S.C.§§ 1251-1376; 40 C.F.R Parts 100-149

These statutes and their implementing regulations govern discharges of water and wastewater to sewers, surface water, and site runoff that is directed to a water body subject to the Acts. They establish point source standards for discharges into surface water bodies under the National Pollutant Discharge Elimination System ("NPDES"). They also establish ambient water quality criteria ("AWQC") for the protection of aquatic organisms and human health.

Washington State Model Toxics Control Act ("MTCA") –
RCW Chapter 70.105D; WAC Chapter 173-340

The State of Washington MTCA contains numerical cleanup standards for groundwater, surface water, soils, air, and sediments. The MTCA regulations that pertain to the Tulalip Landfill are the groundwater and surface water cleanup standards contained in WAC 173-340-720 and -730. These regulations are relevant and appropriate for groundwater and "surface waters of the state" that are affected or potentially affected by a release of a hazardous substance to those waters.

State of Washington Water Pollution Control-Act/Water Resources Act -- Chapters 90.48 and 90.54 of the Revised Code of Washington ("RCW"); Water Quality Standards for Surface Waters -- Chapter 173-201A WAC

These statutes, through their implementing regulations, require the use of all known available and reasonable technologies in the treatment of wastewater prior to a release or discharge of such wastewater into waters of the State. These statutes do not contain any numerical criteria or standards. However, the WAC 173-201A regulations implement the federal requirement that the state develop a water quality control plan. These regulations contain both narrative and quantitative limitations for protection of surface waters by

regulating discharges to sewers and surface waters, and establish discharge limits for water quality parameters and toxic substances.

Federal Solid Waste Municipal Landfill Requirements -- 40 C.F.R. Part 258

These relevant and appropriate regulations require that landfills be closed to meet certain performance standards governing surface slopes, landfill cover construction, and revegetation.

Minimal Functional Standards ("MFS") for Solid Waste Handling, WAC Chapter 173-304

These relevant and appropriate-regulations require that landfills be closed to meet certain performance standards governing surface slopes, landfill cover construction, and revegetation.

Washington State Clean Air Act (R.C.W. 70.94): Puget Sound
Air Pollution Control Authority ("PSAPCA") Regulations I and III

These regulations govern emissions of particulates and certain priority pollutants to the air from on-site sources. The State Clean Air Act and PSAPCA regulations are relevant and appropriate requirements which would ensure that emissions from the interim remedial action will be performed in compliance with the substantive requirements of a PSAPCA permit. However, on-site actions will not require a PSAPCA permit.

The PSAPCA Guidelines For Acceptable Ambient Levels ("AALs") are not ARARs because they are non-promulgated guidance, but instead are guidelines "to be considered" ("TEC") when implementing the selected remedy. The AAL guidelines specify that actions producing air emissions must meet the guidelines. They are used to help implement PSAPCA Regulation III, which governs releases of toxic air pollutants.

8.0 DESCRIPTION OF ALTERNATIVES

The Source Area Containment Feasibility Study (FS) identified and evaluated containment alternatives that could be used ro address threats and potential threats posed by the Site for the Interim Remedial Action. In addition, the Respondents have submitted several alternatives that were not included in the FS and which are discussed below. As discussed in Section 4.0, EPA has prepared the Feasibility Study Analysis for CERCLA Municipal Landfill Sites, September 1993, which provides an evaluation of 30 CERCLA landfill FS reports, and has been included in the Administrative Record for this interim ROD. The Feasibility Study Analysis summarizes the initial identification and screening technologies used in the selection of landfill remedies at the identified CERCLA sites as further support for the identification and screening of technologies and development of alternatives in the Source Area Containment FS for the Tulalip Landfill.

Common Elements

With the exception of the "No Action" alternative, all of the alternatives would include some form of:

- institutional controls, such as land use restrictions that limit or prohibit development or activities conducted on the Site so as to not interfere with performance of the selected remedy, and to prohibit activities that are not protective of human health and the environment (e.g., prohibit any drilling or other excavation through any layer of the cover system that may interfere with the performance of the remedy, and set weight restrictions and weight distribution restrictions for loads that can be placed on the cover);

- a monitoring plan to measure the effectiveness of the remedy and ensure that the remedy remains protective of human health and the environment; and

- a plan for conducting operation and maintenance (O&M).

All "present worth" costs shown below include capital costs and operation and maintenance over a 30-year period, calculated with a discount rate of 5%. Actual costs are predicted to fall within a range of +50 per cent to -30 per cent of cost estimates.

For the geosynthetic cover alternatives that don't include ground water extraction from the deeper Zone 2 aquifer, a common element is that no action would be taken to collect or treat the ground water in Zone 2. For all of the capping alternatives, "clean" runoff water would be discharged to the tidal channels or sloughs surrounding the landfill at a rate and in a manner that will prevent harm to the off-source wetlands.

The alternatives evaluated for addressing the environmental problems are:

8.1 ALTERNATIVE 1 - NO ACTION

Annual Monitoring Cost: $63,000
Total Cost Estimate: $1,030,000

The Superfund program requires that the "no action" alternative be evaluated at every site to establish a baseline for comparison. Under this alternative, EPA would take no further action at the Site to prevent exposure to contaminants, or to prevent the migration of contaminants. The cost estimate above assumes that there would be some monitoring of the leachate seeps and ground water at the Site.

8.2 ALTERNATIVE 2 - ACTIVE LEACHATE SEEP INTERCEPTION AND TREATMENT

Construction Cost: $2,500,000
Annual O&M Cost: $ 220,000
Total Cost Estimate: $5,900,000

Estimated Construction Timeframe: 2 years

Leachate in the Zone 1 ground water that is migrating to the surface through the perimeter landfill berm would be collected and treated. To intercept the leachate, a drainage trench would be built around the landfill. The trench would extend from the surface of the landfill near the perimeter to the bottom of the waste. The trench would be filled with a porous material to collect leachate before it discharges to the surrounding wetlands.

Approximately 24 extraction wells installed around the perimeter within the trench would extract the leachate. The leachate would either be sent to a nearby wastewater treatment plant, or an on-site treatment system would be built. If an on-site treatment system were built, the costs would be significantly higher than the estimate provided above. It is not anticipated that off-source wetlands would be adversely impacted by construction of this alternative.

8.3 ALTERNATIVE 2b - LEACHATE COLLECTION WITH TREATMENT BERM

Alternative 2b was developed by the Respondents and submitted to EPA for consideration subsequent to approval by EPA the Source Area Containment Feasibility Study. The Respondents' submittal describing this alternative (Development and Evaluation of the Treatment Berm Alternative, June 30, 1995) is included in the administrative record for this interim remedy.

Respondents Construction Cost: $11,300,000
Respondents Annual O&M Cost: $ 129,000
Respondents Total Cost Estimate: $13,300,000

EPA Construction Cost: $18,000,000
EPA Annual O&M Cost: $ 179,000
EPA Total Cost Estimate: $21,300,000

Estimated Construction Timeframe: 2 years

This alternative is similar to Alternative 2, except that it includes additional collection trenches across the center of the landfill, and it would pass the landfill leachate through two earthen berms before releasing the leachate to the sloughs. One of these berms would be located in the mouth of the old barge canal, and the other would be constructed on the southern edge of the landfill. The Respondents predict that water leaving the berms would meet water quality cleanup goals as a result of dilution (leachate mixing with slough water), and natural treatment processes such as chemical and biological degradation of contaminants within the berm.

In addition to the perimeter collection system in Alternative 2, collection trenches would also be constructed transecting the landfill surface. The purpose of the additional trenches is to reduce the leachate mound in the center of the landfill, thereby reducing the flow of leachate down into the deeper Zone 2 ground water and out into the sloughs.

The proposed collection system and berm treatment system are unproven technologies that have never been used to control leachate generated by a landfill like Tulalip Landfill. Based on EPA's review of information submitted by the Respondents on this alternative, EPA concluded that the Respondents significantly underestimated the cost of this alternative, given the level of uncertainty involved with the proposed technology. EPA has developed a separate cost estimate for this alternative. Both cost estimates are provided above for comparison.

A traditional, on-site treatment system could also be built to accept the leachate. If an on-site treatment system were built, the costs would be significantly higher than the estimate provided above. The Respondents estimate that 2.8 acres of off-source wetlands would be adversely impacted or lost in order to construct the proposed treatment berms.

8.4 ALTERNATIVE 2b(ii) - LEACHATE SEEP COLLECTION WITH DISCHARGE TO PUBLICLY OWNED TREATMENT WORKS (POTW)

At the October 3, 1995, public meeting, a variation of Alternative 2b was described. In a submittal dated October 24, 1995, more detailed information regarding this variation of Alternative 2b was provided to EPA by the Respondents for consideration during the public comment period on the Proposed Plan. This submittal is available in the administrative record for this interim remedy.

Respondents Construction Cost:	$ 5,900,000
Respondents Annual O&M Cost:	$ 386,000
Respondents Total Cost Estimate:	$11,800,000

EPA Construction Cost:	$13,600,000
EPA Annual O&M Cost:	$ 465,000
EPA Total Cost Estimate:	$20,800,000

Estimated Construction Timeframe: 2 years

Alternative 2b(ii) uses the same basic leachate collection system as Alternative 2b, with some modifications, **28** but instead of sending the leachate through treatment berms, the leachate would be sent to an off-site sewage treatment plant, also commonly referred to as a Publicly Owned Treatment Works (POTW). The submittal proposes to collect approximately 58 million gallons of leachate per year and send it to either the Marysville or Everett POTW, where it would be treated along with other effluent streams received by the POTW. For purposes of clarifying discussion in this Record of Decision, to differentiate this version of alternative 2b from the Treatment Berm version described above, the POTW discharge version shall be referred to henceforth as "Alternative 2b(ii) - Leachate Seep Collection with Discharge to POTW". It is not anticipated that any off-source wetlands would be adversely impacted by construction of this alternative.

8.5 ALTERNATIVE 3 - LEACHATE SEEP AND GROUND WATER COLLECTION AND TREATMENT

Construction Cost:	$12,400,000
Annual O&M Cost:	$ 620,000
Total Cost Estimate:	$22,000,000

Estimated Construction Timeframe: 2 years

Shallow leachate and deeper, contaminated ground water from the landfill would be collected and treated. To minimize the leachate and ground water migrating away from the landfill, and to minimize the amount of uncontaminated ground water that could be pulled in by the pumping system, a "slurry wall" would be constructed underground around the waste. A slurry wall is an wall of low permeability made of clay that is constructed inside a deep, narrow trench. The slurry wall would completely surround the on-source area of the Site. Approximately 24 extraction wells would be installed inside the slurry wall to extract the leachate.

The leachate would be sent to a POTW, or an on-site treatment system would be built. If an on-site treatment system needed to be built, the costs would be significantly higher than the estimate provided above. It is not anticipated that any off-source wetlands would be adversely impacted by construction of this alternative.

28 The concept for the leachate collection system remains basically the same as with Alternative 2b, with the addition of some pumps to help move the leachate through the collection trenches, and some additional sumps.

8.6 ALTERNATIVE 4a - SOIL COVER WITH PASSIVE DRAINAGE

Construction Cost:	$19,500,000
Annual O&M Cost:	$ 170,000
Total Cost Estimate;	$22,100,000

Estimated Construction Timeframe: 2 years

A low hill with a minimum 2% slope would be constructed on the landfill, which would allow rain water to run off the cover under the force of gravity ("passive drainage") . The landfill would be covered with

approximately two feet of clay, which would reduce the amount of rainwater going into the landfill. A protective layer of soil would be placed over the clay layer to protect it.

Ground water modeling conducted by the Respondents during the RI indicates that this alternative would reduce, but not eliminate, the perimeter leachate seeps. It would also reduce the amount of contaminated deeper ground water migrating into the sloughs, but to a lesser extent than the geosynthetic cover alternatives. The cover would prevent contact with contaminants on the landfill surface. In constructing this alternative, approximately 1.7 acres of off-source wetlands would be adversely impacted or lost.

8.7 ALTERNATIVE 4b - GEOSYNTHETIC COVER WITH ACTIVE DRAINAGE

Respondents Construction Cost;	$15,600,000
Respondents Annual O&M Cost:	$ 190,000
Respondents Total Cost Estimate:	$18,600,000
+ EPA Gas Treatment Contingency:	$ 2,700,000
EPA Total Cost Estimate:	$21,300,000

Estimated Construction Timeframe: 2 years

The Site would be graded into a "waffle" pattern, with rain water flowing into many depressions on the surface of the cover. A geosynthetic cover would be installed over this waffle pattern. This geosynthetic cover would basically consist of a single barrier layer, which would be either a type of thick plastic, or a manufactured clay-type sheet product. Twelve inches of clean topsoil would be placed on top of the geosynthetic cover and planted with vegetation to reduce erosion and protect the low permeability layer.

This alternative is less expensive in the short term because the landfill would remain relatively flat (i.e. fill material would not be brought on-site to create a low hill with a 2% slope that would passively drain rain water off of the cover). Rather, a system of pipes and pumps would be installed to pump rain water out of the depressions ("active drainage").

EPA's higher cost estimate for this alternative reflects the possibility that a landfill gas treatment system may be necessary under this type of cover, which is less permeable than a soil cover.

Based on the results of groundwater modeling conducted during the RI/FS, this alternative would substantially reduce infiltration of rain water through the waste, thus minimizing the potential for generation and migration of new leachate. This alternative would be expected to eliminate the perimeter berm leachate seeps within two years, and would substantially reduce migration of leachate into Zone 2. The cover would also prevent contact with contaminants on the landfill surface. In constructing this alternative, approximately 1.7 acres of off-source wetlands would be adversely impacted or lost.

8.8 ALTERNATIVE 4c - GEOSYNTHETIC COVER WITH PASSIVE DRAINAGE

Respondents Construction Cost:	$19,800,000
Respondents Annual O&M Cost:	$ 170,000
Respondents Total Cost Estimate:	$22,400,000
+ EPA Gas Treatment Contingency:	$ 2,700,000
EPA Total Cost Estimate:	$25,100,000

Estimated Construction Timeframe: 2 years

This alternative would include the same actions as Alternative 4b but with passive drainage. The Site would be graded, and fill would be brought to the Site to construct a low hill with a minimum of a two percent slope, over which a geosynthetic cover would be installed. This geosynthetic cover would basically consist of a single barrier layer, which would be either a type of thick plastic, or a manufactured clay-type sheet product. Twelve inches of clean topsoil would be placed on top of the geosynthetic cover and planted with vegetation to reduce erosion and protect the low permeability layer. EPA's higher cost estimate for this alternative reflects the possibility that a landfill gas treatment system may be necessary.

This alternative is expected to minimize the infiltration of surface water into the waste contents of the landfill. The effect of the low permeability cover will be to significantly decrease the levels of contaminated leachate within the landfill waste. As a result, the low permeability cover will eliminate the release of leachate from seeps at the surface and the perimeter of the landfill, and minimize the migration of contaminated water from the landfill through the deeper Zone 2 ground water aquifer to the sloughs.

Based on the results of groundwater modeling conducted during the RI/FS, this alternative would minimize infiltration of rain water through the waste, thus minimizing the potential for generation and migration of new leachate. This alternative would be expected to eliminate the perimeter berm leachate seeps within two years, and would minimize migration of leachate into Zone 2. The cover would also prevent contact with contaminants on the landfill surface. In constructing this alternative, approximately 1.7 acres of off-source wetlands would be adversely impacted or lost.

8.9 ALTERNATIVE 4d - COMPOSITE COVER WITH PASSIVE DRAINAGE

Respondents Construction Cost:	$24,000,000
Respondents Annual O&M-Cost:	$ 200,000
Respondents Total Cost Estimate:	$27,100,000
+ EPA Gas Treatment Contingency:	$ 2,700,000
EPA Total Cost Estimate:	$29,800,000

Estimated Construction Timeframe: 2 years

A composite cover has two low permeability layers instead of just one. Usually a composite cover combines a thick plastic liner with a layer of clay. Composite covers usually develop fewer leaks over time, because one layer can fail and the second layer will still be effective in minimizing infiltration. Although composite covers generally perform better over time than single-layer covers, they are more expensive.

Based on the results of groundwater modeling conducted during the RI/FS, this alternative would minimize infiltration of rain water through the waste, thus minimizing the potential for generation and migration of new leachate. This alternative would be expected to eliminate the perimeter berm leachate seeps within two years, and would minimize migration of leachate into Zone 2. The cover would also prevent contact with contaminants on the landfill surface. EPA's higher cost estimate for this alternative reflects the possibility that a landfill gas treatment system may be necessary. In constructing this alternative, approximately 1.7 acres of off-source wetlands would be adversely impacted or lost.

8.10 ALTERNATIVE 5: GEOSYNTHETIC COVER WITH LEACHATE SEEP CONTROL

Respondents Construction Cost:	$22,200,000
Respondents Annual O&M Cost:	$ 220,000
Respondents Total Cost Estimate:	$25,600,000
+ EPA Gas Treatment Contingency:	$ 2,700,000
EPA Total Cost Estimate:	$28,300,000

Estimated Construction Timeframe: 2 years

The Site would be graded, and fill would be brought to the Site to construct a low hill with a minimum of a two percent slope, over which a geosynthetic cover would be installed. This geosynthetic cover would basically consist of a single barrier layer, which would be either a type of thick plastic, or a manufactured clay-type sheet product. Twelve inches of clean topsoil would be placed on top of the geosynthetic cover and planted with vegetation to reduce erosion and protect the low permeability layer. An active perimeter leachate seep interception system, such as the one described in alternative 2 above, would be installed.

Based on the results of groundwater modeling conducted during the RI/FS, this alternative would minimize infiltration of rain water through the waste, thus minimizing the potential for generation and migration of new leachate. This alternative would be expected to eliminate the perimeter berm leachate seeps soon after construction, and would minimize migration of leachate into Zone 2. The cover would also prevent contact with contaminants on the landfill surface. EPA's higher cost estimate for this alternative reflects the possibility that a landfill gas treatment system may be necessary. In constructing this alternative, approximately 1.7 acres of off-source wetlands would be adversely impacted or lost.

8.11 ALTERNATIVE 6 - Geosynthetic COVER WITH LEACHATE SEEP AND GROUND WATER CONTROLS

Respondents Construction Cost:	$31,700,000
Respondents Annual O&M Cost:	$ 280,000
Respondents Total Cost Estimate:	$36,000,000
+ EPA Gas Treatment Contingency:	$ 2,700,000
EPA Total Cost Estimate:	$38,700,000

Estimated Construction Timeframe: 2 years

In addition to the actions discussed in Alternative 5, this alternative would also include ground water collection and treatment. The ground water would be collected by constructing a Slurry wall around the site, and approximately 24 extraction wells would extract the leachate.

This alternative would practically guarantee the elimination of the perimeter berm leachate seeps soon after construction, and would minimize the generation and migration of leachate in the deeper ground water to the sloughs. The cover would prevent contact with contaminants on the landfill surface. In constructing this alternative, approximately 1.7 acres of off-source wetlands would be adversely impacted or lost.

8.12 OTHER ALTERNATIVES

In addition to the alternatives described above, the Respondents proposed two alternatives which EPA considered and appropriately directed the Respondents to exclude from the feasibility study because they are not protective of human health and the environment and do not attain potential applicable or relevant and appropriate requirements (ARARs). One of these alternatives involved placement of a "leachate seep cover" that would cover the landfill berm and would divert the shallow leachate exiting the berm into the deeper ground water zone, where it would migrate to the sloughs. The other alternative involves "passive leachate seep interception", which was a series of 120 drains that would be installed in the waste, and would also theoretically divert the shallow leachate into the deeper ground water, where it would migrate to the sloughs.

Neither of these alternatives would be protective because they would not effectively contain the landfill contaminants. They would allow all of the leachate currently being generated at the Site to continue to discharge into the surrounding environment. They would only change the route the leachate takes to leave the landfill. Because they would not reduce the total loading of contaminants to the off-source area, they do not meet the NCP remedy evaluation criterion for "Overall Protection of Human Health and the Environment." These alternatives would not meet the criterion for "Compliance with ARARs" because they would be expected to worsen existing AWQC exceedences where Zone 2 ground water enters the sloughs. They would not meet "Short-Term Effectiveness" because they would do nothing to reduce total loading of the landfill contaminants to the environment. These alternatives do not meet, or score relatively poorly on, the "Long-Term Effectiveness and Permanence," "Reduction of Toxicity, Mobility, or Volume through Treatment," and "Implementability" criteria. EPA is also seriously concerned that these alternatives would not function as designed in the field, and the Respondents have not brought other landfills where such technologies have been successfully implemented to EPA's attention.

These alternatives are inconsistent with the NCP and with EPA guidance which states that containment of contaminants is appropriate at landfill sites such as the Tulalip Landfill. The alternatives would re-direct visible leachate exiting the landfill berm down into the aquifer where it would be free to enter the environment unseen via the sloughs. These alternatives also are of questionable cost-effectiveness because in EPA's view they offer no real environmental benefit, but their implementation would require substantial monetary expenditures.

The Respondents' proposal for inclusion of these unsuitable alternatives in the Source Area Containment FS was the subject of a formal dispute resolution process under the RI/FS Administrative Order on Consent (AOC). A summary of this dispute is provided in Section 2 of this ROD. Correspondence and EPA's final determination regarding this dispute is included in the Administrative Record for this interim ROD.

9.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

As required by the National Contingency Plan (NCP), EPA used the nine NCP criteria summarized below to evaluate and compare alternatives. An alternative must meet both criteria 1 and 2, known as "threshold criteria," in order to be selected. Criteria 3 through 7, called "balancing criteria," are evaluated to determine which cleanup method provides the best overall solution. After considering public comments on the Proposed Plan, EPA has concluded there is no reason to alter the selected remedy in this interim ROD on the basis of the last two "modifying" criteria.

1. Overall protection of human health and the environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

The alternatives that would be most protective of human health and the environment are:

4b Geosynthetic Cover, Active Drainage
4c Composite Cover, Passive Drainage
5 Geosynthetic Cover, Seep Control
6 Geosynthetic Cover, Seep and Zone 2 Ground Water Controls

All of these alternatives would protect human health and the environment in the short and long term by effectively containing the landfill wastes and minimizing the migration of contaminants from the Site through the landfill berms or through the deeper ground water zone. These alternatives meet all the remedial action objectives (RAOs) which are described in Section 7.0 of this ROD.

Alternatives that are not protective of human health and the environment are:

1 No Action
2 Active Seep Interception
2b Leachate Collection with Treatment Berm
2b(ii) Leachate Collection with Discharge to POTW
3 Seep and Zone 2 Ground Water Controls
4a Soil Cover, Passive Drainage

The No Action (1), Active Seep Interception (2), and Soil Cover with Passive Drainage (4a) alternatives would not protect human health and the environment because they allow the continued migration of contaminants from the landfill. The No Action (1) and Soil Cover (4a) alternatives would allow the continued release of leachate into surface waters at levels exceeding surface water ARARs, and would fail to attain other RAOs as well. Alternatives 1 and 2 would allow the continued migration of contaminated Zone 2 ground water, and would not prevent contact with landfill contaminants. Alternative 3 would not meet the RAO to minimize infiltration into the landfill waste, and it may not meet the RAO to prevent direct contact with the landfill waste and surface water contamination.

The Leachate Collection with Treatment Berm (2b) Alternative and the Leachate Collection with Discharge to POTW [2b(ii)] Alternative are not considered to be protective of human health and the environment because EPA has significant concerns regarding whether the unproven collection systems proposed for these alternatives, and the unproven Treatment Berm approach proposed for Alternative 2b, would work in the field. There is considerable uncertainty regarding whether Alternative 2b and 2b(ii) would meet many of the RAOs.

There is uncertainty regarding whether the collection systems proposed for the Treatment Berm (2b) or the Discharge to POTW [2b(ii)] alternatives would meet the Zone 1 Leachate RAO, which requires the elimination of leachate that exceed surface water ARARs from, through, and/or under the source area berm. The collection systems proposed for these two alternatives carry significant risk of failure, including the potential for clogging or plugging, and the potential for higher-than-predicted operation and maintenance (O&M) costs due to such problems, and therefore are not considered by EPA to be protective in the long term. These alternatives, as currently configured, may not effectively address exposure to chemical or biological contamination that has been found in water on the landfill surface. These alternatives may not meet the RAO to prevent inhalation and release of landfill gas that exceeds ambient air standards, **29** and over the long term would not meet the RAO to minimize migration of contaminated ground water to the sloughs, These alternatives would not meet the RAO to minimize infiltration into the landfill.

The Treatment Berm system proposed for Alternative 2b is an unproven technology for a Site like Tulalip Landfill, and EPA has serious concerns that the proposed Treatment Berms would not be effective in the long term, would not reduce risks posed by Site contaminants, and would be relatively impermanent. The Treatment Berms could clog relatively quickly, requiring costly frequent replacement of the berms or a significantly higher level of O&M to maintain flow. EPA is concerned that the unproven Treatment Berms may not "treat" landfill contaminants at all, but merely dilute contaminants with "clean", estuary waters before releasing them to the surrounding environment. If the Treatment Berms were to fail to treat contaminants, implementation of Alternative 2b could worsen existing environmental problems at the landfill by hastening the migration of landfill contaminants into the surrounding estuary, and increasing contaminant loading from the Site to the estuary.

29 Construction of either of these two alternatives could lead to increased landfill gas generation. Gas generation in the landfill is currently at a relatively low level probably because most of the waste is saturated. The collection systems proposed for these alternatives, if they work, would lower the height of the leachate mound in Zone 1, leaving much of the waste unsaturated, and a significant increase in landfill gas generation could result. Neither of these two alternatives provides for collection or treatment of landfill gas.

Because Alternative 4b - Geosynthetic Cover with Active Drainage, relies relatively heavily on an active system (i.e., pumps to remove surface water), it also is expected to be less effective in the long term. If the pumping system breaks down or fails to move water off of the cover system quickly, more surface water will tend to penetrate any leaks the capping system. This a1ternative is also considered to be relatively impermanent because active, mechanical systems employing pumps require a higher level of maintenance than passive systems, and are vulnerable to potential increases in the price of power to run them.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets State and Federal environmental laws, regulations, and other requirements that pertain to the Site or, if not, whether a waiver is justified.

Alternatives that are expected to meet all ARARs set out in Section 11.2 of this interim ROD are:

4c	Geosynthetic Cover, Passive Drainage
4d	Composite Cover, Passive Drainage
5	Geosynthetic Cover, Seep Control
6	Geosynthetic Cover, Seep and Zone 2 Ground Water Controls

These alternatives are expected to achieve surface water ARARs at the landfill berm (see Table 11-1) by eliminating leachate seeps, and at the sloughs by eliminating or minimizing Zone 2 ground water migration. These alternatives also meet Minimum Functional Standards (MFS) requirements promulgated by the State of Washington for closure of solid waste landfills. In the long term, these alternatives are expected to contribute to the achievement of state sediment management standards by ceasing the surface discharge of leachate and minimizing the subsurface discharges of leachate that contribute to contamination of off-source sediments.

The following alternatives do not meet some of the ARARs identified in Section 11.2 of this interim ROD:

1	No Action
2	Active Seep Interception
2b	Leachate Collection with Discharge to Treatment Berm
2b(ii)	Leachate Collection with Discharge to POTW
3	Leachate Seep and Ground Water Collection and Treatment
4a	Soil Cover, Passive Drainage
4b	Geosynthetic Cover, Active Drainage

The No Action alternative (1) would not meet surface water ARARs at the leachate seeps nor where Zone 2 ground water discharges to the sloughs. Active Seep Interception (2) would not meet surface water ARARs where Zone 2 ground water discharges to the sloughs. The Soil Cover (4a) is not expected to meet surface water ARARs at either the seeps nor the sloughs, and would not meet the MFS requirements for closure of landfills.

Alternatives 1, 2, 2b, 2b(ii), and 3 do not comply with MFS because they do not include a landfill cover. Alternative 4b, Geosynthetic Cover with Active Drainage, does not comply with MFS because this alternative includes numerous drainage ditches that are less than a 2% slope. Because these alternatives do not meet the MFS ARAR, in order to select any of these alternatives, a waiver of the MFS requirements would have to be invoked, pursuant to 40 C.F.R. 300.430(f)(1)(ii)(C), or EPA would have to find that these minimum specifications for closing landfills are either not relevant or not appropriate at this Site.

In addition, the Leachate Collection with Treatment Berm (2b) alternative may not meet surface water ARARs at the face of the treatment berm if the berm is not effective, and it may not meet surface water ARARs at the sloughs if the collection system is not effective. Finally, because Alternative 2b requires dredging and filling of off-source wetlands, it may not meet Section 404(b) of the Clean Water Act (CWA), which is an ARAR for the Site. CWA 404(b)(1) requires avoidance of wetland destruction if alternative actions are available. Because there are other containment alternatives which could meet the cleanup objectives that have been identified, EPA may be unable to find that there is no practicable alternative to the dredge and fill, as required by Section 404(b) of the CWA.

The alternatives that EPA has determined meet the two threshold criteria (Alternatives 4c, 4d, 5, and 6) will be carried forward through this analysis and evaluated against the balancing criteria. The alternatives that EPA has determined do not meet both of the NCP threshold evaluation criteria [Alternatives 1, 2, 2b, 2b(ii), 3, 4a, and 4b] will not be carried further through this analysis for evaluation against the other NCP criteria..

3. Long-term effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time, and the reliability of such protection.

Alternatives that are expected to be permanent and effective in the long term are:

4c Geosynthetic Cover, Passive Drainage
4d Composite Cover, Passive Drainage
5 Geosynthetic Cover, Seep Control
6 Geosynthetic Cover, Seep and Zone 2 Ground Water Controls

By effectively eliminating all leachate migration from the Site through the landfill berm and eliminating or minimizing leachate migration through the deeper Zone 2 ground water, and by preventing contact with the landfill wastes, these alternatives are expected to effectively contain the landfill wastes and result in no significant residual risk from the source area. These are technologies that have been implemented at hundreds of sites across the country and are known to be relatively effective in the long term. Alternatives 4c and 4d are relatively passive systems (i.e. relatively little need for an outside power source or treatment plant), which increases their permanence and decreases the costs of long-term operation and maintenance of the remedy. Alternatives 5 and 6 are considered to be somewhat less permanent than Alternatives 4c and 4d because they are not passive systems.

30 It is inappropriate to carry Alternatives 1, 2, 2b, 2b(ii), 3, 4a, and 4b further through the NCP criteria evaluation because none of these alternatives meet the threshold criteria. However, it should be noted that, in general, these alternatives also compare poorly against the NCP balancing criteria as well as the threshold criteria. A summary of how EPA would evaluate Alternatives 2b, 2b(ii), 3, and 4b in relation to the balancing criteria is provided in Appendix A of this interim ROD.

4. Reduction of toxicity, mobility, or volume through treatment evaluates an alternatives's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of residual contamination remaining.

Alternative 6 - Cover, Seep and Zone 2 Ground Water Controls, is expected to effectively treat Site contaminants. This alternative would collect and treat the leachate generated by the Site and send it to an off-site sewage treatment plant, or to a treatment plant that would be constructed on-site.

Alternatives 5 - Cover, Seep Control, would partially meet this criterion because it would intercept and treat leachate exiting the perimeter berm, but would not treat the deeper Zone 2 ground water.

Alternatives 4c - Geosynthetic Cover with Passive Drainage, and 4d - Composite Cover with Passive Drainage, are consistent with the presumptive remedy approach of containment of landfill wastes and do not employ any form of treatment.

5. Short-term effectiveness considers how fast the alternative reaches the cleanup goal and the risks the alternative poses to workers, residents, and the environment during construction or implementation of the alternative.

None of these alternatives is expected to pose risk to the surrounding community during construction or implementation because the Site is relatively isolated. Any significant impacts would likely be confined to the immediate vicinity of the Site and would be mitigated.

Each of Alternatives 4c, 4d, 5, and 6 would potentially pose some risk to Workers because all involve some excavation and regrading of waste. However, the type of excavation these alternatives would require is relatively common, and it is anticipated that effective measures would be taken to mitigate any potential risk.

Alternatives 4c, 4d, 5, and 6 may have some short-term adverse impact on the environment during implementation or construction. These capping alternatives would require importing fill material to bring the landfill surface up to the 2% minimum grades required by MFS.31 This additional weight on the landfill may cause a short-term increase in leachate migration through the seeps. On the other hand, Alternatives 5 and 6, which include seep controls, would not have this problem if the seep controls were constructed prior to importing fill for construction of the cover, because the leachate collection system would collect any additional short-term leachate.

Each of Alternatives 4c, 4d, 5, and 6 would potentially achieve the cleanup objective for eliminating the release of leachate from surface seeps. The following alternatives are predicted to "dry up" the leachate seeps and meet surface water ARARs at the sloughs within 2 years of construction completion:

4c Geosynthetic Cover, Passive Drainage
4d Composite Cover, Passive Drainage

These alternatives would cut off infiltration of rain water through the waste, thus minimizing the generation of new leachate. As the existing leachate mound within the waste dissipates, the perimeter seeps are expected to cease to flow within two years, according to the results of ground water modeling conducted by the Respondents during the RI/FS.

The following alternatives would be expected to meet the c1eanup goals for leachate seeps immediately after implementation:

5 Geosynthetic Cover, Leachate Seep Control
6 Geosynthetic Cover, Seep and Zone 2 Ground Water Controls

These alternatives would intercept and collect the perimeter berm leachate, which would result in faster elimination of the seeps.

6. Implementability considers the technical and administrative feasibility of implementing the alternative, such as the relative availability of goods and services. Also, it considers if the technology been used successfully on other similar sites.

Alternatives 4c, 4d, 5, and 6 include construction of a low-permeability landfill cover. Technically, construction of a low permeability landfill cover is a common landfill remedy that can be readily implemented at Tulalip Landfill. Generally, materials for these types of covers are available. The most significant difference in implementability regarding the Tulalip Landfill, in comparison with many other landfills, is that Tulalip landfill is relatively flat, so that a mounded cover must be constructed to minimize infiltration and generation of leachate.

31 However, the amount of off-site fill that would need to be imported can be reduced by re-positioning existing landfill materials to achieve the necessary grades.

Another aspect of implementability is the ability to monitor the remedy's effectiveness, and the ease of maintaining the remedy. Based on EPA's experience at other CERCLA landfills across the country, geosynthetic covers have a known performance record and are relatively reliable if properly constructed. it would be relatively easy to monitor the perimeter leachate seeps evaluate if they dry up. Water levels in piezometers located on the landfill could be monitored to evaluate whether the leachate mound within the waste is falling, which would indicate a reduction in leachate migration through the deeper Zone 2 ground water. An advantage of a landfill cover is that if an obvious problem becomes apparent, such as surface water ponding in the case of a passive drainage cover, it is relatively easy to access and make repairs because the cover is close to the surface of the landfill. All covers develop leaks, and installing a leak detection system beneath the cover is not practical. Non-essential perforations through the cover system should be minimized as they can contribute to imperfections in sealing the liner and in increased leakage.

Alternative 4c - Geosynthetic Cover with Passive Drainage, is clearly implementable at the Site. Alternative 5, Geosynthetic Cover with Seep Control, is considered somewhat less implementable because it relies on the long-term availability of capacity at a sewage treatment plant to accept and treat the collected leachate, which could be a potential administrative problem. The cost of building an on-site treatment plant would significantly increase the cost of this alternative.

Alternative 4d - Composite Cover, Passive Drainage, and Alternative 6 - Geosynthetic Cover, Seep and Zone 2 Ground Water Controls, are considered significantly less implementable. Materials to construct these alternatives are expected to be readily available. However, the Composite Cover with Passive Drainage (4d) would be technically difficult to construct because it would be time consuming and expensive to ensure that all soil material used in a soil barrier layer would meet the required standard for impermeability. An extensive construction monitoring program would be required. The technical implementability of the Cover with Seep Controls and Ground Water controls alternative (6) is considered relatively infeasible because of the difficulty in constructing a slurry wall down into the zone 2 aquifer. Problems such as heaving sands could make construction of such a slurry wall difficult. Also, there is no clear aquitard at depth into which a Zone 2 slurry wall could be effectively anchored. Without an aquitard to anchor the slurry wall, the ground water extraction system could potentially pull in significant volumes of "clean" water from the sloughs along with contaminated ground water, which may greatly increase the treatment costs for this alternative.

7. Cost includes estimated capital and operation and maintenance (O&M) costs, as well as present worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollars. Cost comparison information for all of the alternatives evaluated (including those which do not meet the NCP threshold criteria) is provided in Table 9-1. The net present value of each alternative is listed in millions of dollars, calculated using a discount rate of 5% over 30 years.**32**

8. State acceptance: Because the Tulalip Landfill is located entirely on the Tulalip Indian Reservation, this criterion for this Site is more appropriately "Tribal Acceptance." Based on comments received from the Tulalip Tribes during the public comment period on the Proposed Plan, it is clear that the Tulalip Tribes support the selected alternative. Although State concurrence is not necessary for this Site because the landfill is located on an Indian Reservation, EPA notes that the State of Washington concurs with the selected alternative.**33**

9. Community acceptance considers public response to EPA's Proposed Plan during the public comment period. EPA provided an 80-day public comment period on the interim cleanup options for the Site, and held two public meetings during the comment period.**34** Comments were received on a wide variety of complex issues such as the remedy selection process, data collected from the Site, the Streamlined Risk Assessment, the relative cost of various remedies, concerns about fairness, and concerns about the Site's potential impact on the environment and human health. A Summary of significant comments received during the public comment period, and EPA's responses to these comments, is provided in the "Responsiveness Summary" attached to this Record of Decision (ROD).

32 EPA notes that the need for continued O&M could exceed 30 years.

33 See February 22, 1996, letter from Mary E. Burg of State of Washington Department of Ecology to Chuck Clarke of EPA, in the Administrative Record for this interim remedial action.

34 The NCP requires a minimum public comment period of only 30 days. EPA extended the 30-day public comment period for the Tulalip Landfill Proposed Plan to 80 days.

Based on EPA's evaluation of the comments received, almost all commentors expressed support or opposition to Alternative 4c, EPA's preferred alternative in the Proposed Plan. The following parties expressed general opposition to the preferred alternative:

- Some of the Potentially Responsible Parties (PRPs), their attorneys, and consultants
- Balance Council, an organization which represents some of the PRPs

The following parties expressed general support for the preferred alternative:

- Citizens who live near the Site
- People for Puget Sound
- Audubon Society
- Tulalip Tribes of Washington, and their consultants
- Northwest Indian Fisheries Commission

The Northwest Indian Fisheries Commission expressed support for the preferred alternative but argued it didn't go far enough and more should be done. The Snohomish County Health District provided comments but did not take a clear position with regard to the preferred alternative.

Based on the comments received, EPA believes the selected remedy will be acceptable to citizens who live near the Site and who may use the areas around the Site.

Compatibility with Anticipated Future Land Use is an additional element of Community Acceptance, which, in the case of Tulalip Landfill, considers whether an alternative would be compatible with commercial, light industrial, and recreational use. Alternatives 4c, 4d, 5, and 6, which include a landfill cover, are fully compatible with these future land use objectives.

10.0 THE SELECTED INTERIM REMEDY

EPA has considered, at some point in the CERCLA process, all of the alternatives that have ever been submitted to EPA by the Respondents, including Alternative 2b and 2b (ii) , which were submitted after the Source Area Containment Feasibility Study was approved by EPA. After the close of the public comment period, EPA re-considered and re-evaluated all of the alternatives, including those alternatives which do not include a landfill cover. Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine NCP criteria, and public comments, EPA has determined that Alternative 4c, Geosynthetic Cover with Passive Drainage, is the most appropriate interim remedial action for the Tulalip Landfill Superfund Site. The Tulalip Tribes of Washington support this determination. This interim remedy would achieve substantial reduction in risk to the environment by containing the contaminants within the landfill.

EPA expects that a containment remedy that eliminates or minimizes the total contaminant loading contribution from the landfill would improve the long-term viability of the sensitive surrounding environment. Of all of the alternatives considered by EPA, a geosynthetic cover with passive drainage is the least expensive, protective containment alternative that meets all ARARs identified for this interim remedial action and that will, with a relatively high degree of certainty, effectively stem the generation and flow of contaminated leachate into the surface waters surrounding the landfill. Because this containment remedy relies on a "passive" design that does not include pumps to move surface water off of the landfill surface, the selected remedy would require less frequent monitoring to ensure that all the pumps are operational. A low permeability cover is implementable as a well known technology, and is expected to be effective in long-term." The selected interim remedy is a proven technology, with established means to monitor and maintain the cover. The selected interim remedy will reliably achieve the remedial action objectives of reducing risks, without the need for also establishing elaborate contingency measures to plan for the possible failure of less certain measures. This cover will also allow for future use of the Site for recreation, light industry or commercial enterprises, with certain institutional controls required to protect the integrity of the cover. Therefore, EPA believes that Alternative 4c provides the best balance of trade-offs among the alternatives with respect to the evaluation criteria.

EPA expects the selected interim remedy to be effective in minimizing the migration of contaminated landfill leachate from the source area. At present, the RI/FS shows that contaminated leachate from the landfill wastes is migrating to surface water by way of leachate seeps on the surface and through deeper ground water that flows into the sloughs adjacent to the landfill. Available information suggests that leachate migration is causing contamination of soils, sediments, and fish in the off-source wetlands. In the FS, the Respondents predict that a low permeability cover will minimize the generation of additional leachate by greatly reducing the movement of contaminated ground water to surface water. This is expected to significantly reduce mass loadings of metals, organics, and bioaccumulative substances into the off-source sloughs and wetlands. By minimizing the discharge of leachate from the landfill, the selected interim remedy is also expected to minimize the discharge of resistant strains of pathogenic microbes which have been found in landfill leachate. For these reasons, the selected interim remedy in this ROD also includes EPA's decision to take no action to remediate ground water.

35 All covers develop leaks. However, leaks can be minimized through proper design, construction materials, construction quality assurance procedures, and O&M.

10.1 DESCRIPTION OF THE SELECTED REMEDY

The selected interim remedy requires installation of an engineered, low permeability cover over the source area of the landfill. The source area to be covered shall include the waste that is located within the current perimeter of the approximately 147 acre landfill, including any waste or contaminated soils in the perimeter berm, and any contaminated soils in the existing cover material. The interim remedy shall include the following:

10.1.1 General Interim Remedy Requirements

The interim remedy shall be designed and constructed in accordance with the Remedial Action Objectives (RAOs) described in Section 7 of this ROD. The work will be conducted in accordance with plans approved by EPA. Guidance documents including, but riot limited to, the guidance documents listed in the Appendix C of this interim ROD, shall be used to design, construct, and operate and maintain the landfill cover system. During detailed design, potential problems that may occur during implementation of the selected remedial action, such as the effect of surface water discharge on off-source wetlands, will be evaluated and addressed as appropriate. In general, all components of the interim remedy (e.g., gas collection pipes) shall be constructed beneath the surface of the cover system to facilitate future use objectives that have been identified for the Site. Non-essential perforations through the cover system shall be minimized.

This interim remedial action is expected to result in adverse impacts or loss of approximately 1.7 acres of off-source wetlands. All such losses or impacts to off-source wetlands shall be properly addressed under the substantive requirements of Section 404 of the CWA. During all phases of the interim remedial action, any adverse impacts and potential adverse impacts to the off-source area shall be avoided and minimized. Any adverse impacts shall be mitigated. As part of complying with the Stormwater Runoff and Erosion Surface RAO, surface water runoff from the cover system shall be released to the surrounding environment at a controlled rate and in a controlled manner such that damage to the surrounding environment is prevented. The interim action shall avoid and minimize adverse impact to the aesthetic value of the off-source wetlands. The interim action shall not result in erosion of off-source wetlands or destabilize wetland banks.

Mitigation or replacement for the loss of any on-source wetlands that have grown on the landfill surface since the existing cover material was placed over the waste in 1979 will not be required under CWA Section

402. **36**

10.1.2 Regrading

The cover system shall be designed and constructed so that the grade of the surface slopes shall be no less than two percent after allowing for predicted settlement. The final grades shall be attained through importing "clean fill" to the Site, and through excavation or regrading of waste and existing cover soil. Imported clean fill may be temporarily stockpiled on the source area prior to regrading activities, however, erosion control measures must be implemented to prevent erosion of the stockpiled fall into the surrounding wetlands.

A Regrading Erosion Control Plan shall be developed and approved by EPA prior to initiation of regrading activities. This Plan shall ensure that regrading activities do not result in erosion of on-source sc4l to off-source areas. The Plan shall incorporate appropriate erosion control measures which may include, but are not limited to, silt fences and sedimentation ponds.

Appropriate measures shall be implemented to ensure control of dust during regrading activities.

Appropriate measures shall be implemented to ensure that odors are minimized during-regrading activities. Regrading activities shall be planned and implemented such that the amount of time that waste is exposed to air shall be minimized. Any and all exposed waste shall be thoroughly covered with at least six inches of "clean" cover soil at the end of each construction day.

36 For more information, see the subheading "Operations at the Landfill after 1985" in Section 2.0 - Site History and Enforcement Actions of this interim ROD; see also interim ROD Section 11.2.3 Action-Specific ARARs.

10.1.3 Landfill Cover System

The landfill cover system shall consist, from the lowest layer to the uppermost layer, of the following:

Gas collection system: A landfill gas collection system located between the waste and the cushion layer shall be designed, constructed, operated, and maintained to control combustible or toxic gas release from the landfill waste. Collection pipes shall be installed below the surface of the cover system. The gas collection system, and any associated features such as vents, shall be designed and constructed to be flush with the surface of the landfill so as not to interfere with future land use activities on the landfill surface. The gas collection system shall be designed to be compatible with a landfill gas treatment system, which may need to be added after construction of the gas collection system is completed. The gas collection system shall be designed and constructed so that if the addition of a gas treatment system becomes necessary, the collection system can be modified to incorporate the gas treatment system without constructing additional gas collection pipes above the landfill surface.

Cushion layer: A cushion layer shall be placed over the landfill waste to minimize the potential of the waste damaging the low hydraulic conductivity layer. The cushion layer shall have a minimum thickness of 1 foot (12 inches), and shall be free of rock, fractured stone, debris, cobbles, rubbish and roots. In general, the cushion layer shall be designed and constructed in accordance with the following requirements:

- One hundred percent (loot) of the largest soil particles in the cushion layer shall pass the .75" sieve.
- The top 6 (six) inches of the cushion layer shall be no coarser than Unified Soil Classification System (USCS) sand (SP) with loot of the washed, rounded sand passing the .25" sieve.
- The cushion layer shall be uniformly compacted to a minimum 90% modified proctor density (ASTM D1557) and shall be smoothed with a smooth drum or vibratory roller.
- Deformations in the cushion layer surface shall not be greater than 1 inch in depth, except if the bedding surface is frozen. If the bedding surface is frozen, then deformations shall be no greater than .5 inches in depth.

Low hydraulic conductivity layer: A low hydraulic conductivity layer shall consist of either of the following;

- a minimum 50 mils flexible membrane liner designed, constructed, operated and maintained to minimize infiltration of water into the landfill; or

- a geosynthetic clay liner with a maximum permeability of 1 X 10-9 cm/sec designed, constructed, operated and maintained to minimize infiltration of water into the landfill. **37**

Cover layer: A cover layer shall be compromised of a minimum of 1 foot (12 inches) of soil capable of sustaining plant species that will minimize erosion and providing adequate depth and composition to minimize damage to the low hydraulic conductivity layer (i.e., loading and stresses from above, plant species roots and burrowing animal intrusion, etc.)

Vegetation layer: The uppermost component is vegetation designed to impede erosion while still allowing surface runoff from major storm events. Seed for the vegetation layer shall be sown as soon as practicable after placement of the cover layer to minimize erosion of the cover layer. If the vegetative layer does not "take", in all portions of the cover, these areas shall be reseeded as necessary until the vegetative layer is sufficiently established. Plant species that may invade or otherwise impair the off-source wetlands shall not be selected for the vegetation layer.

The cover system shall incorporate the construction of, at a minimum, 5 piezometers that shall be located and installed for the purpose of evaluating the height of the Zone 1 leachate mound after construction of the interim remedy.

The cover surface slopes shall not be less than two percent, after accommodating for settlement and subsidence, and the side slopes shall not be more than thirty-three percent.

The cover system shall be designed, operated, constructed and maintained to the meet the following performance standards:

(a) Prevent direct contact of people, animals, and surface water with landfill waste.

(b) Prevent landfill waste from being wind blown.

(c) Provide long-term minimization of migration of liquids through the landfill.

(d) Function with minimum maintenance.

(e) Promote drainage and minimize erosion or abrasion of the cover.

(f) Prevent damage to the cover from a 100-year flood event.

(g) Accommodate settling and subsidence so that the cover's integrity is maintained.

(h) Ensure that the perimeter berm or edge of the landfill is structurally stable.

(i) Establish and implement a construction quality assurance (CQA) program for the cover system to ensure that the constructed cover meets or exceeds all design criteria and specifications. This shall include, but shall not be limited to, aggressive testing of field seams to ensure water tightness, and field placement oversight.

The cover system design shall include permanent access roads for operation and maintenance (0&M) activities.

37 A geosynthetic clay liner is reasonably expected to achieve a maximum permeability of 1 X 10-9 cm/sec. The Respondents assumed this permeability rate in the ground water modeling they conducted for this remedial alternative during the RI.

10.1.4 Air Controls

If necessary to meet PSAPCA requirements, a landfill gas treatment system shall be installed. Additional study shall be conducted during remedial design to evaluate whether a landfill gas treatment system is needed. However, it is possible that sufficient information on which to base a decision on whether gas treatment is necessary may be available only after construction of the interim remedy.

10.1.5 Post-Construction Care

The integrity and effectiveness of the final cover shall be maintained, including periodic inspections and making repairs to the cover as necessary to correct the effects of settling, subsidence, erosion, or other events. A written Operation and Maintenance (O&M) Plan shall be completed and approved by EPA. The O&M Plan shall be fully implemented at the Site in perpetuity, or until EPA determines in writing that implementation of the O&M Plan is no longer necessary at the Site.

Post-construction escape of leachate or contaminated run-off shall be controlled, minimized or eliminated, to the extent necessary, to protect human health and the environment. Run-on and run-off shall be prevented from eroding or otherwise damaging the final cover and the surrounding wetlands and tributaries including the tidal channels.

Post-Construction Monitoring

A post-construction monitoring plan shall be prepared. The plan shall be approved by EPA. The monitoring plan shall be sufficient to provide for evaluation of the effectiveness of the remedy and evaluate whether the remedy remains protective of human health and the environment. Post-construction monitoring of the interim remedy shall consist of, at a minimum, the following:

- Perimeter leachate seeps: A minimum of 10 landfill perimeter leachate seeps shall be located and identified for sampling. On a quarterly basis, the leachate seeps shall be sampled and analyzed for chemicals that are surface water ARARs (during detailed design, EPA may select a subset of the surface water ARARs from Table 11-1 to be used for post-construction monitoring purposes) . For metals, total metals analyses shall be performed for the perimeter leachate seep samples. The validated data results shall be provided to EPA, on paper in raw and summary form, and electronically (i.e., a computer file) in a format acceptable to EPA. Data validation reports for all of the samples shall be included. The flow rate from each seep shall be measured, and the daily flow rate from all ten seeps shall be estimated. All of this information described in this paragraph, including the validated sample results, shall be reported to EPA within 3 months of each sampling event as part of a "quarterly monitoring report". The "quarterly monitoring report" shall include a summary narrative that includes information relevant to the sampling --event and data analyses, such as the date(s) the samples were taken, who took the samples, and any problems that were encountered. Each "quarterly monitoring report" shall provide one graph for each leachate seep which compares the flow estimate of each leachate seep from the most recent sampling round with each of the flow estimates from the seep from all previous sampling rounds.

- Zone 1 Piezometers: the Zone 1 leachate mound levels in the on-source piezometers shall be measured on a quarterly basis, and this information shall be submitted to EPA in the next quarterly monitoring report. Each quarterly monitoring report shall provide a graph or graphs which compares each piezometer water level reading from the most recent sampling rounds with that piezometer's water level readings from all previous sampling rounds.

- Zone 2 ground water: Because the selected remedy is expected to effectively contain the landfill wastes by minimizing the migration of leachate away from the landfill, and because, based on current information, EPA does not expect that additional, future actions will be necessary to remediate Zone 2 ground water, EPA concludes that post-construction data collection from of the Zone 2 aquifer is unnecessary.

- Landfill gas collection system: Monitoring requirements for the landfill gas collection system shall be described in the O&M Plan. These monitoring requirements shall be sufficient to determine whether the a gas treatment system must be added to ensure compliance with PSAPCA requirements. If a gas treatment system is added in the future, the O&M Plan shall be amended to include monitoring requirements for the gas treatment system.

EPA may require additional monitoring to assess or ensure the short-term and long-term effectiveness and protectiveness of the selected interim remedy. Each quarterly monitoring report shall summarize all of the monitoring data collected during the quarter, and shall provide, based on consideration of all of the collected data, an evaluation of the effectiveness and protectiveness of the interim remedy. Any changes or trends in the data from previous quarter(s) shall be noted and described. After the first two years of post-construction monitoring are complete, EPA may re-evaluate the frequency of collection of the post-monitoring data and the frequency of the quarterly monitoring reports.

The point of compliance for contaminated ground water and leachate is the location where ground water discharges to surface water. For Zone 1 ground water (i.e., the leachate seeps), the point of compliance shall be the location at which leachate exits the exterior face of the perimeter landfill berm. For Zone 2

ground water, the point of compliance shall be the location where Zone 2 ground water discharges to surface water. No mixing zone(s) shall be allowed in surface water to measure compliance with surface water ARARs. Because current information indicates that the interim remedial action, if properly constructed, will achieve the surface water ARARs where Zone 2 ground water discharges to the sloughs, additional monitoring or evaluation of the Zone 2 pathway for compliance purposes is unnecessary.

10.1.6 Institutional Controls

Institutional controls will be used to assure continued effectiveness of the interim remedial action and to prevent human exposure to contamination remaining at the Site at concentrations above health-based risk levels. Specific controls include land use restrictions to limit or prohibit activities that could interfere with performance of the selected remedy. In addition, ground water use restrictions will be implemented to prevent the use of contaminated ground water.

When design and construction of the interim remedy are complete, EPA and the Tulalip Tribes shall develop and approve a document titled "Routine Use of Tulalip ('Big Flats') Landfill," the purpose of which shall be to identify future uses of the Site that are compatible with the continued integrity of the cover system and protective of the off-source areas of the Site. This document shall delineate routine site uses that may occur on the surface of the cover and uses that shall not occur, in accordance with the land use restrictions established in this interim ROD. This document shall be implemented at the Site in perpetuity, or until EPA and the Tulalip Tribes determine in writing that implementation of the document is no longer necessary at the Site. After the document is approved by EPA and the Tulalip Tribes, the document can be modified by mutual written agreement by both EPA and the Tulalip Tribes.

The land use and ground water use restrictions will be imposed on all property that comprises the Site as covenants running with the land for the purpose of protecting human health and the environment by protecting in perpetuity the remedial actions which have been and will be taken at the Site. One or more instruments, including the "Routine Use of Tulalip ('Big Flats') Landfill" document, in a form acceptable to EPA, shall be prepared setting forth covenants, conditions and restrictions that accomplish the following objectives:

- Existing "access roadways," including the east access roadway, and the access roadways at the southeast and northwest corners of the landfill surface running from the landfill surface to the slough waterways, shall be preserved as points of access to the landfill.

- An "Environmental Buffer Zone" on the surface of the landfill cover shall be defined, established, and maintained in perpetuity. The Environmental Buffer Zone shall extend along the entire perimeter of the landfill, from the edge of the landfill cover surface (not including the relatively steep slope of the exterior face of any perimeter berm) inward toward the center of the landfill. On the north, east, and southern edges of the cover, the Environmental Buffer Zone shall be no less than 50 feet in width. On the entire western edge of the cover (i.e., the edge facing the large, approximately 170-acre wetland area to the west of the landfill), the Environmental Buffer Zone shall be no less than 250 feet in width. The Environmental Buffer Zone shall be preserved and maintained in perpetuity for passive recreation activities such as walking. The Environmental Buffer Zone shall be seeded with vegetation that is compatible with the landfill cover system and that will also provide beneficial habitat uses for wildlife. No structures, materials, or other objects shall be located, placed, stored, or constructed on the Environmental Buffer Zone, with the following sole exception: the Environmental Buffer Zone may be crossed by necessary Site access roadways. These access roadways shall be constructed and maintained in a manner that is consistent with and does not inhibit the recreational use of the Environmental Buffer Zone.

- A clearly visible sign shall be placed and maintained in perpetuity at the landfill entrance which summarizes the activities that may occur on the landfill cover, and shall also summarize the restrictions on use, as described in the "Routine Use of Tulalip ('Big Flats') Landfill" document. The sign shall also depict a map of the Site which clearly delineates the locations and extent of the Environmental Buffer Zone, and shall clearly summarize the use restrictions for the Site, including a written description of the Environmental Buffer Zone and their purpose. The sign shall include the phone number of a Tribal officer or employee who is familiar with the requirements of the "Routine Use of Tulalip ('Big Flats') Landfill" document and is able to provide direction to potential users of the Site regarding the requirements of the document.

- Site users shall comply with the "Routine Use of Tulalip ('Big Flats') Landfill" document described above.

Any commercial or development activity on the landfill surface will require advance, written agreement between EPA and the Tribes to ensure the continued integrity of the cover system and to ensure protection of human health and the environment.

10.2 INTEGRATING THE INTERIM ACTION WITH LAND USE PLANS

The selected interim remedy shall allow the on-source area of the Site to be productively used by people, with some restrictions necessary to prevent damage to the interim remedy. The selected interim remedy shall be designed and constructed to allow for the types of future use activities described in the Big Flats Land Use Program, Tulalip Landfill Remedial Investigation and Feasibility Study (July 10, 1994).

10.3 PERIODIC REVIEW

Because the interim remedial action will result in hazardous substances remaining on-site above health-based levels, a review will be conducted no less often than every five years after of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. If the five-year review indicates that this interim remedial action is not providing adequate protection of human health and the environment, additional containment action for the source area, such as implementation of a perimeter leachate collection and treatment system, may be necessary.

10.4 ESTIMATED COST OF THE SELECTED INTERIM REMEDY

EPA's total cost estimate for the selected interim remedy is $25.1 million. **38** This cost estimate reflects the total cost estimate provided by the Respondents in the Source Area Containment Feasibility Study ($22.4 million), in addition to an EPA cost estimate that accounts for the possibility that a landfill gas treatment system may be necessary ($2.7 million).

As summarized in Table 10-1, the Respondents, cost estimate for the selected interim remedy has capital costs of $19.8 Million and annual operation and maintenance costs of $170,000 per year. The total net present value of their estimate is approximately $22.4 million, assuming a net discount rate of 5%. Costs for this alternative are highly dependent on the assumption that the perimeter elevation of the graded surface will be 12 feet; raising or lowering this elevation could have a significant impact, on the cost because it may directly affect the amount of off-Site fill that would need to be brought in to achieve the 2% surface grades required by the State of Washington MFS. Table 10-1 shows that the cost estimate for "import soil" for grading purposes is $4,000,000, out of total capital costs of $19,841,000.

Figure 10-1 shows EPA's probable cost estimate for a contingent landfill gas treatment system, which may be necessary to comply with air pollution control requirements. The total net present value for the contingent gas system, assuming a net discount rate of 5%, is $2.7 million. O&M costs for the gas treatment options range from $75,000 per year for a surface collection system with an open flare, to $131,000 per year for a vertical well system with an enclosed flare. Information supporting this probable cost estimate is provided in Figure 10-1 and Appendix B of this interim ROD.

11.0 STATUTORY DETERMINATIONS

The interim remedial action selected for implementation at the Tulalip Landfill Site is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this limited-scope action, and is cost-effective. Because this action may not constitute the final remedy for the Site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, may be further addressed by a final response action. Given that this is an interim action ROD, review of this Site and of this interim remedy will be ongoing as EPA continues to evaluate whether additional remedies for the on-source or off-source area of the Site are necessary.

38 Remedy alternative cost estimates assume Operation and Maintenance (O&M) costs over a 30-year period and a discount rate of 5%. The actual number of years that O&M may be required at the Site may be greater than 30 years. Actual Site costs are predicted to fall within a range of +50 per cent to -30 per cent for all remedy alternative cost estimates.

11.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected interim remedy is protective of human health and the environment. The interim remedy at this Site will permanently reduce the risks presently posed to human health and the environment by preventing contact with waste using a low permeability cover and institutional controls to restrict disturbance of the cover. The seep contact, seep migration, and groundwater migration RAOs are achieved by minimizing infiltration thereby minimizing leachate generation. As a result the interim remedial action will be

protective of human health and the environment in the long term.

The interim remedial action includes significant construction activities that could pose minor risks to workers and will result in the loss of approximately 1.7 acres of off-source wetlands. These risks and off-source wetlands loss will be mitigated as appropriate to ensure that this alternative is protective of human health and the environment.

11.2 COMPLIANCE WITH ARARS

This interim action complies with Federal and State applicable or relevant and appropriate requirements (ARARs) for limited-scope action. As stated above, this interim action will minimize infiltration and leachate generation. Thus, seeps and ground water discharge with constituent concentrations that exceed chemical specific ARARs will be eliminated or minimized.

The Site is located on Tribal lands, and leachate from the Site is discharged to surrounding wetlands, tidal channels, and sloughs. State environmental laws and regulations affecting actions taken or occurring entirely on-Site are not legally applicable, but nevertheless may be relevant and appropriate. Under Section 300.400(g) (2) of the NCP, certain state laws an regulations may be relevant and appropriate to this interim remedial action. For example, the state laws and regulations may be relevant and appropriate if the purpose of the state law or regulation is similar to the purpose of this interim remedial action (e,g., if there is a state regulation which sets surface water quality standards for certain chemicals or substances for the purpose of protection of aquatic life and human health, then regulations would be relevant and appropriate to this interim action, as the purpose of this interim action is to protect aquatic life and human health from exposures to hazardous substances contained in the landfill leachate). As a general matter, permits are not required for on-site actions at NPL Sites, however, the substantive requirements of a permit that would otherwise be required must be met. The following is a discussion of the ARARs identified for this Site and for the selected interim remedial action.

11.2.1 Chemical-Specific ARARs

Chemical-specific requirements are usually health- or risk-based numerical values or methodologies that establish the acceptable amount or concentration of a chemical in the ambient environment. Following are the chemical-specific requirements for the Tulalip Landfill:

State of Washington Water Pollution Control Act/Water Resources Act -- Chapt2rs 90.48 and 90.54 of the Revised Code of Washington ("RCW"); and the State of
Washington Water Quality Standards for Surface Waters -- Chapter 173-201A WAC

These statutes, through their implementing regulations including, but not limited to, those requirements codified at Chapter 173-201A of the Washington Administrative Code ("WAC"), require the use of all known available and reasonable technologies in the treatment of wastewater prior to a release or discharge of such wastewater into waters of the State. The statutes themselves do not contain any numerical criteria or standards. However, Chapter 173-201A of the WAC contains both narrative and quantitative limitations for protection of surface waters by regulating discharges to sewers and surface waters, and establish discharge limits for water quality parameters and toxic substances.

Because the leachate seeps and Zone 2 groundwater at the site discharge into waters of the State, and since the WAC Chapter 173-201A requirements set the water quality standards for surface water, the WAC 173-201A regulations are relevant and appropriate for this interim remedial action. Specifically, for this interim remedial action, the surface water limitations 'are described in Table 11-1. For monitoring purposes, EPA may select a subset of the surface water ARARs listed in Table 11-1 during detailed design. The surface water ARARs listed in Table 11-1 do not account for practical quantitation limits (PQLs), or surface water background. To account for PQLs and background, EPA plans to adjust compliance levels for the Table 11-1 ARARs as appropriate.

Given the presence of marine and estuarine aquatic organisms in the waters surrounding the Landfill, the marine criteria listed in WAC 173-201A-040 are considered to be the relevant and appropriate standards which are to be complied with for discharges to surface waters associated with this interim action.

This interim action will attain the WAC 173-201A ARARs by stemming the flow of contaminated ground from the source area. Specifically, the selected interim remedy is expected to minimize the discharge of leachate to Zone 2, and eliminate the perimeter berm leachate seep discharges through the perimeter berm. EPA notes that the selected interim remedy is not expected to achieve surface water ARARs immediately after construction. It may take a few years (ground water modeling conducted by the Respondents estimated 2 years) for the selected interim remedy to eliminate the perimeter berm seeps, however, EPA expects that all surface water ARARs will be met by the conclusion of remedial action at the Site as required by CERCLA as amended by

SARA. Over the long term, Alterative 4c allows significantly less loading of contaminants to the surrounding environment, and significantly 1ess leachate to discharge from the landfill than other, less expensive alternatives, notably Alternatives 2b and 2b(ii).

Federal Water Pollution Control Act ("FWPCA")/Clean Water Act ("CWA") – 33 U.S.C. §§ 1251-1376; 40 C.F.R Parts 100-149

These statutes and their implementing regulations govern discharges of water and wastewater to sewers, surface water, and site runoff that is directed to a water body subject to the Acts. They establish point source standards for discharges into surface water bodies under the National Pollutant Discharge Elimination System ("NPDES"). They also establish ambient water quality criteria ("AWQC") for the protection of aquatic organisms and human health.

Federal AWQC, promulgated at 40 C.F.R. Part 131, are guidelines set for various contaminants in surface water bodies. These guidelines are expected to be protective of most aquatic life against acute or chronic toxicity, or protective of human health with respect to fish consumption and water ingestion. CERCLA Section 121(d) (2) (B) (i) specifically states that water quality criteria are to be attained "where relevant and appropriate" at CERCLA sites.

The federal AWQC are used by the States to set water quality standards for surface water. See Chapter 173-201A WAC. In general, the state water quality standards for surface water adopt the federal AWQC, and in some cases are more stringent. In those cases in which the state standards are more stringent than the federal standards, the state standards are more relevant and appropriate than the federal standards.

The federal AWQC are relevant and appropriate to this interim action because the purpose of the federal AWQC, among other things, is to-protect aquatic organisms and human health from high levels of toxic pollutants, and the purpose of this interim action is to minimize the release of leachate containing toxic pollutants from the landfill to the adjacent wetlands and sloughs which would harm human health and aquatic organisms. Thus, EPA believes that the use of federal AWQC are well suited to the Tulalip Landfill. Federal AWQC that are relevant and appropriate requirements for this interim response are provided in Table 11-1.

The wetlands and tidal channels surrounding the Site are included in the CWA definition of "surface water," and the use of AWQC to evaluate leachate seeps discharging directly into the wetlands and tidal channels is therefore relevant and appropriate.

This interim action is expected to attain surface water ARARs, including the federal AWQC, by stemming the flow of contaminants from the landfill (see the last paragraph of the section above regarding "State of Washington Water Pollution Control Act/Water Resources Act").

Certain arguments were raised by the Respondents regarding the federal AWQC and the state water quality standards during the preparation of the Feasibility Study by the Respondents under the AOC. The Respondents initiated the formal Dispute Resolution process under the AOC to resolve these arguments. Since these issues affected EPA's decision-making process at this Site, a discussion of these disputed issues and the outcomes is given below.

Use of Mixing Zones. EPA's final determination in the Dispute Resolution process stated that mixing zones are not appropriate for evaluating compliance with state water quality standards at the Tulalip Landfill. EPA's position is consistent with WAC Chapter 173-201A, which is identified as an ARAR in this interim ROD for the Site. Under the CWA and WAC 173-201A-100, the term "surface waters" includes wetlands, tidal channels, and mudflats, which are precisely the kind of landforms found around the perimeter of the landfill. Results of the RI indicate that the landfill leachate contains hazardous substances in concentrations exceeding the WAC 173-201A standards. This leachate is regularly discharging directly to the wetlands and mudflats that surround the landfill. Therefore, the leachate discharges must attain the WAC 173-201A standards at the point where leachate discharges into surface waters around the landfill.

Respondents failed to justify the use of a mixing zone for evaluating compliance with AWQCs because they did not provide to EPA in the RI/FS any information which shows that the Tulalip Landfill leachate meets any of the conditions set forth in WAC 173-201A-100, which must be met in order for a mixing zone to be granted. Some of these conditions include, but are not limited information which clearly indicates the mixing zone would not have a reasonable potential to cause a loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses of the water body, result in damage to the ecosystem, or adversely affect public health. See WAC 173-201A-100(4). Information collected by the Respondents contractors shows numerous measured exceedances of AWQC in landfill leachate. These exceedances indicate that the landfill leachate has a reasonable potential to present an imminent and substantial endangerment to public health, welfare, or the environment.

Additionally, EPA believes that use of a mixing zone is inappropriate at the Tulalip Landfill because a

mixing zone would not be protective of organisms that live in the sediments surrounding the landfill. These species are likely to be directly exposed to concentrated levels of chemicals from the leachate seeps when there is no "clean" water available for mixing when there is a low tide, and at locations where Zone 2 ground water discharges to surface waters.

Explanation of how the State of Washington regards the use of mixing zones or "dilution zones" at hazardous substance sites can be found in the MTCA groundwater protection standards codified at WAC 173-340-720 (6) (d) (i) , which states as follows:

> "(d) At sites where the affected ground water flows into nearby surface water, the cleanup level may be based on protection of the surface water. At these sites, the department may approve a conditional point of compliance that is located within the surface water as close as technically possible to the point or points where ground water flows into the surface water. Conditional points of compliance may be approved only if the following requirements are met:
>
> > (i) Use of a dilution zone under WAC 173-201-035 [now WAC 173-201A-100] to demonstrate compliance with surface water cleanup levels shall not be allowed."

This is relevant and appropriate for both the leachate that discharges through the landfill berm directly into surface waters of the state (i.e., the surrounding wetlands), and the leachate that migrates through the deeper ground water and directly enter the sloughs (also surface waters). Both of these discharges are ground water discharges to surface water, and as such the MTCA regulations would not allow the use of a dilution zone to demonstrate compliance with the surface water cleanup levels. Use of "brackish water AWQCs. The Respondents also raised in Dispute Resolution the issue of interpolation of AWQCs for "brackish" waters, as permitted under WAC 173-201A-060(2). EPA's final determination in the Dispute Resolution was that the most appropriate ARARs analysis consistent with CERCLA and the NCP uses the most stringent of the freshwater or marine criteria to determine compliance with ARARs in an environment where both freshwater and marine biota may be present.

Review of the available biological survey data indicates that primarily marine organisms inhabit the waters surrounding the Tulalip Landfill. The presence of marine aquatic receptors in the vicinity of the Landfill is of primary importance in the selection of relevant and appropriate water quality criteria. use of marine organisms observed near the Site are likely the primary receptors for off-site contaminant migration. As such, use of marine criteria for evaluating potential toxicity to these organisms is the most appropriate and protective approach. Therefore, EPA determined that interpolating brackish water quality criteria for this Site is not appropriate.

Use of dissolved metals data for calculating AWQC under State law. A third issue raised by the Respondents in Dispute Resolution relates to the use of dissolved metals data, as well as total metals, in calculating Marine Chronic Criteria (MCC) AWQC under WAC 173-201A-040, footnote dd. This issue involves several ARARs: Federal Water Quality Criteria (FWQC), state ambient water quality standards, and state cleanup requirements promulgated under MTCA. EPA agrees with the Respondents that the AWQC promulgated by the State, and most recently FWQC, measure at least some of the water quality criteria using dissolved metals data. However, WAC 173-340-730(7)(c) states that "[c] ompliance with surface water cleanup standards shall be determined by analyses of unfiltered surface water samples, unless it can be demonstrated that a filtered sample provides a more representative measure of surface water quality." The Respondents did not demonstrate that the filtered samples would provide a more representative measure of surface water quality. As such, and based on available information, unfiltered samples provide a more representative measure of surface water quality at that Site.

This approach is consistent with EPA's May 4, 1995, Administrative Stay of specific metals criteria contained in the National Toxics Rule ("NTR") 60 Fed. Reg. 22228 (May 4, 1995). The NTR contains numeric water quality criteria for toxic pollutants and was promulgated by EPA on December 22, 1992, for the fourteen states that had not adopted sufficient water quality criteria (of which the State of Washington was one). The NTR brought those states into compliance with Section 303(c)(2)(B) of the Clean Water Act, which required all states to adopt criteria for all toxic pollutants. Among the criteria in the NTR were aquatic life water quality criteria for metals.

At the time the NTR was promulgated, it was EPA's policy to express metals criteria using total recoverable metal concentrations. While metals criteria could be implemented by measuring either total recoverable metal or dissolved metal, total recoverable metal measurement, being more conservative, provided a greater level of protection than dissolved metal measurement. See 60 Fed. Reg. at 22228.

After promulgation of the NTR, EPA continued to address the issue of how to best express metals criteria. EPA held a meeting with invited experts in January 1993 to further elicit comment on the use of total recoverable versus dissolved metal criteria. on October 1, 1993, the EPA Office of Water issued guidance (the "Metals Policy") on the interpretation and implementation of metals criteria providing that

"[it is now the policy of the Office of Water that the use of dissolved metal to set and measure compliance with water quality standards is the recommended approach, because dissolved metal more closely approximates the bioavailable fraction of metal in the water column than does total recoverable metal." (Underlining added). See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria."

A number of plaintiffs brought lawsuits in 1993 challenging the NTR metals criteria. In settlement of that litigation, EPA agreed to issue the May 4, 1995, administrative stay of the numeric aquatic life water quality criteria (expressed as total recoverable metal). This stay will remain in effect until EPA promulgates new metals criteria based upon dissolved metal.

However, on page 22230 of the May.4, 1995, administrative stay, EPA stated the following concerning the office of Water's October 1, 1993, "Metals Policy":

> "The adoption of the Metals Policy did not change the Agency's position that the existing total recoverable criteria published under Section 304(a) of the Clean Water Act continue to be scientifically defensible. EPA developed the total recoverable criteria using high-quality analytical data and are still scientifically defensible criteria. When developing and adopting its own standards, a State, in making its risk management decision, may wish to consider sediment, food chain effects and other fate-related issues and decide to adopt total recoverable or dissolved metals criteria. " (Emphasis added).

Thus, EPA recognizes that using total metals criteria may in some cases be the best way to quantify the risk posed by exposure to metals to aquatic life and human health. In this case, EPA has decided that quantifying total, rather than dissolved, metals concentrations in leachate seeps is the most appropriate approach for assessing overall exposure (via all exposure routes including ingestion and dermal contact) and potential ecological risks to fish and invertebrates residing in the vicinity of the Tulalip Landfill. EPA does not consider the filtered leachate data to adequately represent the potential risks to these receptors at this Site, and thus requires that total metals must be used for assessing such risks and for showing compliance with the ARARs.

Washington State Model Toxics Control Act ("MTCA") –
RCW Chapter 70.105D; WAC Chapter 173-340

MTCA contains numerical cleanup standards for groundwater, surface water, soils, air, and sediments. The MTCA regulations that pertain to the Tulalip Landfill are the groundwater and surface water cleanup standards contained in WAC 173-340-720 and -730. These regulations address groundwaters and "surface waters of the state" that are affected or potentially affected by a release of a hazardous substance to those waters.

WAC 173-340-720 regulations are relevant and appropriate to this interim remedial action because the purpose of these regulations is to protect human health and the environment the establishment of numeric cleanup standards for hazardous substances in groundwater and contain prerequisites for the use of "mixing zones" to determine compliance with these standards when groundwater discharges to surface waters. Likewise, the purpose of this interim action is to protect human health and the environment by minimizing leachate discharges from the Tulalip Landfill which contain hazardous substances above the numeric standards in the regulations.

In addition, WAC 173-340-730 regulations are relevant and appropriate to this interim remedial action because the purpose of these regulations is to protect human health and the environment through the establishment of numeric cleanup standards for surface water. Likewise, the purpose of this interim action is to protect human health and the environment and surface water by minimizing leachate discharges from the Tulalip Landfill which contain hazardous substances above the numeric standards in the regulations. Thus, EPA believes that the use of WAC 173-340-720 and -730 are well-suited to the Tulalip Landfill.

This interim action will attain the MTCA ARARs identified above by effectively stemming the flow of leachate from the landfill (see the last paragraph of the section above regarding "State of Washington Water Pollution Control Act/Water Resources Act."

11.2.2 Location-Specific ARARs

Location-specific ARARs are restrictions placed on either the concentration of hazardous substances or the conduct of activities performed in certain locations. They may restrict or preclude certain remedial actions or may apply only to certain portions of the area of contamination.

U.S. Fish & Wildlife Coordination Act- 16 U.S.C. §§ 661 et seq.

The Fish and Wildlife Coordination Act prohibits water pollution with any substance which is deleterious to fish, plant life, or bird life. Contaminated leachate from the Tulalip Landfill discharges into the surface water surrounding the landfill, causing potential harm to fish, plant life, and bird life; therefore, this Act is relevant and appropriate to the Implementation of the selected interim remedial action.

This interim action will attain the requirements of this Act as the cap will minimize the continued production of leachate from the Tulalip Landfill and thereby minimize pollution from the Landfill which may be deleterious to wildlife.

11.2.3 Action-Specific ARARs

Action-specific ARARs are typically technology- or activity-based requirements or limitations on actions. These requirements are not triggered by the specific contaminants identified at a site, but by activities related to the management of these contaminants.

Landfill Regrading and Capping

Federal Standards for Municipal Solid Waste Landfills, 40 C.F.R. Part 258

Minimal Functional Standards ("MFS") for Solid Waste Handling, WAC Chapter 173-304

The federal regulations governing landfill closure are codified at 40 C.F.R. Section 258.60. These regulations require installation of a final cover system that is designed to minimize infiltration and erosion. This final cover system must be comprised of an erosion layer underlain by an infiltration layer as follows:

1) "The infiltration layer must be comprised of a minimum of 18 inches of earthen material that has a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1x10-5 cm/sec, whichever is less, and" (40 C.F.R. Section 258.60(a)(1).

2) "The erosion layer must consist of a minimum of 6 inches of earthen material that is capable of sustaining native plant growth." (40 C.F.R. Section 258.60 (a)(2).

These federal regulations are relevant and appropriate for the Tulalip Landfill because the regulations address closure of solid waste landfills and EPA believes their use at the Tulalip Landfill is well suited.

To the extent that the Washington State MFS are more stringent than the federal requirements, the MFS will be the ARAR which must be met at the Site. The Washington State MFS regulations for solid waste are provided in WAC 173-304. These regulations require that landfills will be closed to meet the following criteria at closure:

1) "At least two feet of 1 X 10-6 cm/sec or lower permeability soil or equivalent shall be placed upon the final lifts" and that "Artificial liners may replace soil covers provided that a minimum of fifty mils thickness is used" (WAC 173-304-460(3)(e)(i)).

2) "The grade of the surface slopes shall be no less than two percent" (WAC 173-304-460(3)(e) (ii)).

3) "Final cover of at least six inches of topsoil be placed over the soil cover and seeded with grass, other shallow rooted vegetation or other native vegetation" (WAC 173-304-460(3)(e)(iii)).

The current State of Washington MFS for landfill closure under WAC 173-304 are not legally applicable because the Site is located on Tribal lands where State requirements are not enforceable. However, the current MFS standards are relevant and appropriate because the Tulalip Landfill was a disposal site for solid wastes, and the purpose of WAC 173-304 was to specify requirements which are suited for use in specifying how landfills should be closed. The stated purpose of these regulations is "establishing these standards as minimum standards for solid waste handling to provide a state-wide consistency and expectation as to the level at which solid waste is managed throughout the state." WAC 173-304-010(6). The specific requirements stated above are well suited to the interim remedial action to be performed at this Site, and are therefore, relevant and appropriate requirements.

This interim action will attain the 40 CFR Part 257 requirements, and the WAC 173-304 requirements through the installation of a cap which meets or exceeds the specific technical requirements listed above. The cap will meet or exceed the Federal closure requirements and the State MFS requirements, including the requirements for final slopes, cover components, and construction measures.

WAC Chapter 173-301 was the State of Washington's old MFS for solid waste that was effective from 1972 to 1985 and was in place in 1979. These regulations required that sanitary landfill surface areas be closed by covering with an equivalent of two feet of compacted soil that is sloped to allow for surface water runoff (WAC 173-301-305). The old MFS regulations also required that the finished surface of the filled area be covered with adequate tillable soil and seeded with native grasses or other suitable vegetation (WAC 173-301-306). The WAC 173-301 MFS regulations are not ARARs for this interim action, as they do not meet the requirement of being legally in effect at this time (they are no longer promulgated, instead they have been superseded by Chapter 173-304 WAC).

Excavation and Filling

Section 402 of the Clean Water Act ("CWA")-- 33 U.S.C. § 1342

Normally, any sort of action to dredge or fill wetlands is governed by Section 404, not 402, of the CWA. However, in November 1984, the U.S. Army Corps of Engineers informed the Tulalip Tribes of the Corps, decision that the landfill capping activities that the Tribes were undertaking in the 1980's would fall under the authority of Section 402 of the CWA, not Section 404. The Corps based its reasoning on the fact that the Corps characterized the Tribes, efforts to install a more effective cover over the Tulalip Landfill wastes as "an essential feature of the landfill/wasting operation" at the Site which the Corps believed was subject to Section 402 of the CWA. Thus, for the purposes of this interim action, Section 402 of the CWA is the applicable requirement governing capping activities occurring on the on-source area of the landfill, not Section 404.

Section 402 of the CWA established the NPDES permit program, which governs direct discharges from point sources. The NPDES permit regulations contain provisions for discharge limitations, monitoring requirements, and best management practices. Because this interim action is being conducted entirely on-site, Section 121 (e) of CERCLA does not require that a NPDES permit be issued to cover these on-site discharges. However, this interim action will meet all substantive requirements of a NPDES permit for any on-site discharges. Consistent with the requirements of CWA Section 402, mitigation for the loss of any on-source wetlands that may exist on the landfill surface will not be required under this ARAR.

This interim action will attain the substantive requirements of Section 402, including NPDES, for the placement of fill on the on-source area of the landfill during detailed design and remedial action by minimizing the generation and discharge of leachate from the landfill source area into surface waters. Discharges to the off-source area of the Site are not covered under CWA Section 402 (see the discussion below regarding CWA Section 404).

Section 404 of the Clean Water Act -- 33 C.F.R. Parts 320 through 330 and 40 C.F.R. Part 230

Section 404 of the CWA regulates the discharge of fill material into the waters of the U.S., including wetlands. The guidelines for this program are set forth in 33 C.F.R. Parts 320 through 330 and 40 C.F.R. Part 230, and are established to ensure that proposed discharges are evaluated with respect to impacts on aquatic ecosystems. Thus, Section 404 and its implementing regulations are applicable to any dredge and fill actions occurring off-source as part of this interim action.

The regulations set up two separate forms of authorization for the discharge of dredged or fill material into wetlands. The first are nationwide permits which authorize certain activities in wetlands if that activity and the permittee satisfy all of the nationwide permit terms and conditions. Nationwide Permit Number 38 authorizes specific work needed to contain, stabilize, or remove hazardous and-toxic wastes, provided such work is done, ordered, or sponsored by a government agency with appropriate authority. The second form of authorization, an individual permit, is required for off-source dredge and fill actions if the Corps of Engineers determines that the activities will result in more that minimal impacts to the wetlands. Any discharge or fill material into the wetlands surrounding the Site which are not authorized in a nationwide permit will require an evaluation in accordance with Section 404 (b) (1) of the CWA and a determination by EPA regarding compliance with the substantive requirements of CWA 404 guidelines and the type and level of mitigation appropriate for the project.

This interim action will attain the substantive requirements of Section 404(b) for the of the CWA for the off-source areas during detailed design and remedial action. Discharges to the landfill surface are not covered under CWA 404 (see the section above regarding CWA 402).

Air Emissions

Clean Air Act (42 U.S.C. §§ 7401 et sea.) -- National Primary and Secondary Ambient Air Quality Standards, 40 C.F.R. Part SO; Washington-State Clean Air Act (R.C.W. 70.94); Puget Sound Air Pollution Control Authority ("PSAPCA") Regulations I and III.

These regulations govern emissions of particulates and certain priority pollutants to the air from on-site sources. Federal Clean Air Act regulations are applicable for on-site air emissions for control of dust particles emitted to the air during remedial activities. Remedial actions that would result in air emissions will be designed to meet federal air quality standards. The state Clean Air Act and PSAPCA regulations are relevant and appropriate requirements. Remedial actions that could involve releases of contaminants to the air will be performed in compliance with the substantive requirements of a PSAPCA permit; however, on-Site actions will not require a PSAPCA permit.

These air emissions requirements will be attained during and after construction of the interim remedial action. An evaluation will be conducted to ensure that landfill gas emissions comply with these requirements.

11.2.4 To Be Considered

The following are not ARARs, but instead are "to be considered" ("TBC") when implementing the selected remedy. Detailed design and construction of the interim remedy shall be consistent with the TBCs as appropriate.

Coastal Zone Management Act ("CZMA"), 6 U.S.C. §§ 1451-1464; State of Washington Shoreline Management Act ("SMA"), Chapter 90.58 RCW

These statutes impose certain requirements for construction and development of shorelines. The prerequisite of these statutes, the presence of shorelines of statewide significance, including marine waters and wetlands, is met at this Site given that the Snohomish River Delta has been identified as a shoreline of state significance.

These statutes are TBC during detailed design and remedial action.

40 C.F.R. Part 6, Appendix A

40 C.F.R. Part 6, Appendix A implements two Executive Orders, Executive Order 11988 - "Protection of Floodplains" and Executive Order 11990 - "Protection of Wetlands"). Normally, this Appendix would be considered for both the on-source and off-source areas of the Site, but because the on-source area is to be addressed under the requirements of CWA 402, this Appendix is to be considered for only the off-source areas of the Site. The two Executive orders are also TBCs, and are described directly below.

This Appendix is TBC for the off-source areas during detailed design and remedial action.

Executive Order 11988 - "Protection of Floodplains" and
Executive Order 11990 - "Protection of Wetlands"

These two Executive Orders are implemented by 40 C.F.R. Part 6, Appendix A, which is described directly above. The Executive Orders direct that actions occurring within floodplains must be performed so as to avoid adverse impact to the floodplain, and to minimize potential harm and to restore and preserve the natural and beneficial values of the floodplain, and that actions occurring within a wetland must be performed so as to minimize the destruction, loss, or degradation of wetlands. The prerequisite for the floodplain Executive Order to apply is that actions will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas. Although the landfill surface is above the 100 year floodplain, the surrounding wetlands are below the flood level.

Within and adjacent to wetlands, Executive Order 11990 and EPA's Wetlands Action Plan direct actions to be performed so as to minimize the destruction, loss, or degradation of wetlands. The off-source areas of the Site are ecologically very productive wetlands that have been classified as wetlands by the Army Corps of Engineers, therefore, both the wetlands Executive Order and the Wetlands Action Plan are to be considered in the off-source area of the Site when implementing the remedy.

These Executive orders are TBC for the off-source areas during detailed design and remedial action.

State of Washington Shoreline Management Act ("SMA") --
Chapter 90.58 RCW, WAC Chapter 173-16

WAC 173-16-060(14) directs landfilling in shoreline areas to be designed such that significant damage to existing ecological values or natural resources does not occur. In addition, fill materials should be of such quality that they will not cause water quality problems and perimeters of fills should be vegetated or otherwise protected from erosion.

Guidelines for shoreline protection measures (such as riprapping and other bank stabilization measures) are provided in WAC 173-16-060(17). Shoreline protection measures should be located, designed, and constructed to avoid the need for channelization and to protect the natural character of the streamway.

These regulations are TBC for the off-source areas for this interim action because the actions to be taken as part of the interim action, excavation and filling, are the same actions regulated by the SMA and WAC 173-16. In addition, the locations where the interim action is taking place (e.g., filling of off-source wetlands for placement of the cap, bank stabilization measures, and stormwater controls constructed in the off-source wetlands) are the same locations regulated by the Act and WAC 173-16. Thus, the SMA and WAC 173-16 are TBC.

The SMA and WAC 173-16 are TBCs for the off-source wetlands during detailed design and remedial action. The interim remedy shall include shoreline protection measure(s) as appropriate, during and after construction, to avoid channelization in the off-source area and to protect the natural character of the off-source area.

PSAPCA Guidelines For Acceptable Ambient Levels ("AALs")

These guidelines are not ARARs because they are non-promulgated guidance, but instead are guidelines to be considered when implementing the selected remedy. This TBC shall be considered when remedial actions produce air emissions. The AAL guidelines specify that actions producing air emissions must meet the guidelines. They are used to help implement PSAPCA Regulation III (see the discussion under "Air Emissions" in Section 11.2.3 - Action-Specific ARARs), which governs releases of toxic air pollutants.

These guidelines shall be considered in decision-making regarding air emissions and the potential need for landfill gas treatment.

11.3 COST-EFFECTIVENESS

Cost savings are built into the presumptive remedy approach. The EPA guidance document "Presumptive Remedies: Policy and Procedures, EPA 540-F-93-047 (September, 1993) states on page 2:

"Why Should Presumptive Remedies Be Used?

Presumptive remedies are expected to have several benefits. Limiting the number of technologies considered should promote focused data collection, resulting in streamlined site assessments and accelerated remedy selection decisions which achieve time and cost savings. Additional time savings could be realized during the remedial design since early knowledge of the remedy may allow technology-specific data to be collected upfront during the remedial investigation (RI). Presumptive remedies will also produce the added benefit of promoting consistency in remedy selection, and improving the predictability of the remedy selection process for communities and potentially responsible parties (PRPs)." (underlining added).

In the case of Tulalip Landfill, EPA and the PRPs were able to achieve cost and time savings by structuring the RI/FS to follow the presumptive remedy approach. Money and time were saved because EPA and the PRPs agreed in the RI/FS AOC to focus the data collection and streamline site assessments. This early/interim ROD represents accelerated remedy selection, which translates into time and cost savings.

The cost of the selected interim remedy is proportional to its overall effectiveness and it represents a reasonable value for the money to be spent. The selected interim remedy is the expensive alternative that meets both of the NCP threshold remedy evaluation criteria: overall protection of human health and the environment, and compliance with applicable or relevant and appropriate requirements.

EPA's total cost estimate for the selected interim alternative is $25.1 million. This cost estimate reflects the total cost estimate provided by the Respondents in the Source Area Containment Feasibility Study ($22.4 million), in addition to an EPA cost estimate that accounts for the possibility that a landfill gas treatment system may be necessary ($2.7 million) to meet emissions requirements of the Puget Sound Air Pollution Control Authority (PSAPCA).

EPA believes that there is significantly more certainty associated with the cost estimate for the selected interim remedy than for some of the other alternatives that did not meet the NCP threshold criteria, especially Alternatives 2b and 2b(ii), which the Respondents assert are viable containment alternatives. The selected interim remedy includes a low permeability landfill cover system, which is a proven technology for containing landfill wastes. Materials for landfill covers are, in general, readily available, and their costs are relatively certain. Low permeability covers have been installed on hundreds of landfill across the country. Based on EPA's experience with landfill covers, EPA believes that a properly constructed landfill

covers is likely to effectively contain the waste at the Tulalip Landfill over the long term with relatively low operation and maintenance (O&M) costs. Landfill covers have a proven track record as an effective, relatively low cost remedy for landfill sites. Following implementation of the landfill cover, there is relatively little likelihood that the cover would fail to contain the landfill contaminants, and thus costly contingent actions will be avoided. Because of the knowledge base that has been developed regarding landfill covers and their performance, EPA believes that the cost estimate for the selected interim remedy is relatively accurate. EPA notes that a significant factor affecting the cost of the selected interim remedy is the cost of importing fill to attain the minimum surface slopes required by the MFS. If the amount or cost of imported fill can be minimized during detailed design, the actual cost of the selected interim remedy may be less than the $25.1 million estimate. In addition, if treatment of landfill gas turns out to be unnecessary, the total cost estimate for the selected interim remedy falls to $22.4 million, an estimated savings of $2.7 million.

EPA believes that the cost estimates for Alternatives 2b and 2b(ii), on the other hand, are considerably less certain. Because the implementability and effectiveness of these alternatives at a Site like Tulalip Landfill are unknown, 39 the actual cost of implementing either of these alternatives could turn out to be much higher than the current cost estimates that have been developed by EPA and the Respondents. In EPA's view, the significant differences between the Respondents' cost estimates for Alternatives 2b and 2b(ii) ($13.3 million and $11.8 million, respectively), and EPA's cost estimates for the same alternatives ($21.3 million and 20.8 million, respectively), reflect the uncertainty of the cost estimates for these alternatives, as compared to the relative certainty of the cost estimate for the selected interim remedy.

EPA's cost estimates for Alternatives 2b and 2b(ii) are significantly higher than the Respondents' estimates in part because EPA has attempted to fashion more realistic cost estimates that take into account some of the uncertainty that is inherent in these alternatives.**40** When EPA's cost estimates for Alternatives 2b and 2b(ii) are used, it is clear that the costs for these alternatives are relatively comparable to the cost of the selected interim remedy. However, even EPA's more realistic cost estimates could seriously underestimate the actual costs of implementing 2b and 2b(ii) if unforeseen problems develop which would require expensive contingent actions to mitigate the problems. EPA has serious concerns with regard to the potential implementability and effectiveness of Alternatives 2b and 2b(ii). **41** For example, EPA believes that the collection system proposed for these alternatives could develop serious problems, such as clogging or plugging of the drainage media in the collection trenches.**42** In the event that the collection system turns out to be ineffective at containing landfill wastes, or prohibitively expensive to operate and maintain, it may eventually be necessary to implement the Alternative 4c cover as a contingent action, which would significantly raise the total source area response costs. EPA also has significant concerns with regard to the long term effectiveness of the Alternative 2b treatment berms as they have been proposed for use at this Site. **43**

39 The Respondents have been unable to identify any other similar landfill Site where a similar system has been successfully implemented.

40 See interim ROD Appendix A for more information on how and why the Respondents and EPA's cost estimates for Alternatives 2b and 2b (ii) differ).

41 See interim ROD Appendix A.

42 See interim ROD Appendix D for EPA's specific comments on the Respondents' proposal for Alternative 2b(ii).

43 See EPA's August 3, 1995 comment letter on Alternative 2b (Eric Winiecki, EPA, to Anthony Burgess, Golder), in the administrative record for this interim ROD.

As discussed in the Proposed Plan at page 18, the $170,000 per acre estimate for the selected interim remedy is significantly less than the average cost per acre found in a study conducted by the U.S. Department of Defense of a number of landfills (see the document "Comparison of DOD and EPA/Private Sector Waste Site Cleanup Efforts" in the administrative record for this interim ROD). The Department of Defense study concluded that. the actual average cost per acre to remediate the landfills they studied was $208,000 for landfill remedies implemented by the Department of Defense, and $294,000 per acre for landfill remedies implemented by EPA or private parties.

Available information also indicates that the cost per acre for implementing the selected interim remedy is comparable (actually somewhat lower) than the average cost per acre for implementing landfill covers at landfills of similar size. In comparing the cost per acre of the selected interim remedy with landfills of similar size where a landfill cover was selected, the average cost per acre for other landfills exceeds- $173,000,**44** versus $170,000 per acre for the selected interim remedy (see Appendix E of this interim ROD for more information). Although no two landfills are exactly the same in terms of acreage and details of the

remedy, in general, available suggests that the cost per acre predicted for the selected interim remedy is comparable to or less than the per acre costs for other landfills.

Because the selected interim remedy is a "passive" system that does not require any pumps or other Active systems, the operation and maintenance (O&M) costs for this alternative are low relative to those predicted for Alternatives 2b and 2b(ii) which rely on active pumping systems. Lower O&M costs make the selected interim remedy a more effective remedy for the long term.

In summary, EPA believes that the selected interim remedy 4c is the most cost effective alternative because it is the lowest cost alternative that meets the two NCP threshold criteria. Given the proven track record of low permeability covers as implementable and effective containment remedies at landfill sites like the Tulalip Landfill, EPA believes that the selected interim remedy is the least expensive remedy that is most likely to provide an adequate level of protection at a reasonable cost, with relatively low risk that the cost estimate for 4c would be significantly exceeded.

EPA concludes that, relative to Alternatives 2b and 2b (ii) the selected interim remedy is cost effective because when EPA's more realistic cost estimates are used, the relative costs of 2b, 2b(ii), and 4c are comparable. In addition:

- EPA believes there is a relatively low level of certainty with regard to the available cost estimates for Alternatives 2b and 2b(ii);
- EPA has sufficient reason to expect that the actual costs of these Alternatives 2b and 2b(ii) could turn out to be significantly higher than the EPA cost estimates for these alternatives because they employ unproven technologies and could require expensive contingencies, possibly including implementation of a low-permeability cover, to effectively contain the landfill wastes.
- EPA does not consider Alternatives 2b and 2b(ii) to be protective of human health and the environment, nor do these alternatives meet ARARs. **45**

Given these considerations, EPA concludes that the selected interim remedy is more cost effective than Alternatives 2b and 2b(ii). In considering the NCP evaluation criteria, the selected remedy represents the best balance of costs, protectiveness, permanence, and long-term effectiveness.

44 This estimate is derived from cost estimates for relevant landfills from the 30 CERCLA landfill FS Reports that EPA used as the basis for developing the Feasibility Study for CERCLA Municipal Landfills, September, 1993

45 See Section 9,0 - Summary of Comparative Analysis of Alternatives.

11.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The principal element of the selected remedial action is containment which will be achieved by installing a low permeability cap over the landfill. Containment addresses the primary threat at the Site of infiltration and leachate generation by minimizing groundwater and seep leachate migration and achieving all the seep and groundwater RAOS. The integrity of the cap is less susceptible to settlement-induced cracking, freeze/thaw cycles, erosion, and biointrusion than a soil cover and is more reliable. It is expected that minor maintenance will be necessary to correct vegetation and soil loss due to erosion, A low permeability cap is implementable as a well known technology, and is expected to be effective in the long-term. The passive storm water controls will require minimal maintenance to ensure proper functioning thereby lending permanence to the remedial action.

11.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The presumptive remedy approach for municipal-type landfills utilizes the remedial approach of containment of wastes rather than treatment of wastes. The selected interim remedy is expected to reduce the toxicity and mobility of the waste, and minimize the generation of new leachate. By minimizing infiltration of rain water into the landfill, the height of the leachate mound in Zone 1 will fall. As more of the waste becomes unsaturated, the rate of "natural,, biological degradation of the waste is expected to increase. Because this interim action does not constitute the final remedy for the Site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element may be addressed by the final response action.

12.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for Interim Remedial Action for the Tulalip Landfill Superfund Site was released for public comment on August 7, 1995. The Plan identified Alternative 4c, Geosynthetic Cover with Passive Drainage, as the preferred alternative for interim remedial action. The public comment period closed on October 25, 1995. EPA has considered, at some point in the CERCLA process, all of the remedy alternatives that have ever been submitted to EPA by the Respondents, including Alternatives 2b and 2b(ii), which were submitted after the Source Area Containment Feasibility Study was approved by EPA. After the close of the public comment period, EPA re-considered and re-evaluated all of the alternatives, including-those alternatives which do not include a landfill cover. EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of this information, including these comments, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary.

Several non-significant changes occurred between issuance of the Proposed Plan and the signing of this interim ROD, none of which required any Modifications to the preferred remedy as described in the Proposed Plan. For example:

- The Proposed Plan stated that Alternative 2b would meet RAOs. However, upon review of public comments, additional, more recent technical information, and EPA's re-evaluation of all the remedial alternatives, EPA determined that Alternative 2b does not meet all of the RAOs that have been identified for the interim remedial action.

- The ATSDR Preliminary Public Health Assessment for Tulalip Landfill (June, 1993), which was inadvertently omitted from the Administrative Record, was added to the Administrative Record after the public comment period. However, EPA did not rely on the information in the Preliminary Report because of the preliminary nature of the report, and because all of the data on which the report was based was collected Prior to the RI.

- In accordance with the NCP, EPA has added some documents to the Administrative Record that were generated or received by EPA during or after the public comment period on the Proposed Plan.

- After the 80-day public comment period on the Proposed Plan ended on October 25, 1995, EPA received several letters from the Respondents transmitting late comments on the Proposed Plan EPA has added these late comments to the Administrative Record for this interim ROD. However, in accordance with the requirements of the NCP, EPA has determined that, based on EPA's review of the late comments, modification of the preferred remedy as described in the Proposed Plan was not necessary nor appropriate. EPA has not provided written responses to the Respondents, late comments.

- EPA made minor modifications to some of the RAOs as they were described in the Proposed Plan. EPA added an RAO ("Minimize Infiltration") based on the recommendation of EPA Presumptive Remedy guidance. See Section 7.0.

- Interim ROD Tables 6-1 and 6-2 and Figure 6-1 were updated from the Streamlined Risk Assessment based on changes EPA has made to the Region 3 risk-based concentrations for soil ingestion since the development of the Streamlined Risk Assessment.

EPA does not consider any of these changes to be significant.

46 See "Comparison of the Leachate Collection and Treatment Alternative (2B) with the FML Cover Alternative (4C) ,"Golder, October, 1995; Memorandum, Keith Pine of Weston to Eric Winiecki of EPA, February 7, 1996. See also Memorandum, Eric Winiecki to The File, August 4, 1995, re: EPA Review of Alternative 2b - Treatment Berm; Section 9.0 and Appendices A, D and E of this interim ROD.

Table 1-1: Species of Concern

Species	Distance from Site (if available)	State Status	Federal Status
Bald Eagle (Haliaeetus leucocephalus)	Within 1/4 mile	T	T
Osprey (Pandion haliaetus)	Within 1/4 mile	M	_
Great Blue Heron (Ardea herodias)	Within 1/4 mile	M	_
Arctic Tern (Sterna paradisaea)	Within 1/4 mile	M	_
Harbor Seal (Phoca vitulina)	_ _ _	M	_
California Sea Lion (Zalophus californicus)	_ _ _	M	_
Stellar (northern) Sea Lion (Eumetopias jubatus)	_ _ _	T	T
Dall's Porpoise (Phoecoenoides dalli)	_ _ _	M	_
Pacific Harbor Porpoise (Phecoena phocoena)	_ _ _	C	_
Bull Trout (Salvelinus confluentus)	_ _ _	_ _	C
Bellers Ground Beetle (Agonum belleri)	Within 4 miles	C	C
Yuma Myotis (Myotis yumanensis)	Within 4 miles	_ _	C
Black Lily (Fritillaria camschatcensis)	Within 4 miles	S	_
Water Lobelia (Lobelia dortmanna)	Within 15 miles	S	_
Choriso Bog-Orchid (Platanthera chorisiana)	Within 15 miles	T	_

T = Threatened M = Monitored C = Candidate for Listing S = Sensitive

Sources: December, 1987, letter from U.S. Fish and Wildlife Service to Jerry Lee, E&E.
December, 1987, letter from Washington Department of Wildlife to Jerry Lee, &E.
January, 1988, letter from Washington Department of Natural Resources to Jerry Lee, E&E
Preliminary Natural Resource Survey, Tulalip Landfill, Marysville, Washington
National Oceanic and Atmospheric Administration (NOAA), 1991.
February 6, 1996, letter from NOAA to Eric Winiecki, EPA.

Table 5-1
Chemicals Detected in On-Source and Off-Source Media

Analyte	On-Source Media								Off-Source Media			
	Zone 1 Groundwater	Zone 2 Groundwater	Surface Water	Surface Soil	Surface Soil	Subsurface Soil	Surface Soil	Leachate Water	Surface Seep1	Subsurface Sediment	Fish Sediment	Fish Tissue
VOCs												
1,1-Dichloroethane		X										X
2-Butanone			X									
2-Hexanone			X									
4-Methyl-2-Pentanone											X	
Acetone				X		X				X		X
Benzene	X			X		X						X
Butylbenzene												X
Carbon disulfide			X									
Chlorobenzene	X		X		X						X	
Chlorethane												X
Chloroform				X								
Chloromethane	X		X							X	X	
cis-1,2-Dichloroethene											X	
Ethylbenzene	X		X		X							X
Methylene Chloride			X								X	
Toluene	X			X		X						X
Total Xylenes	X			X		X						X
Trichloroethene						X						
BNAs												
1,2,4-Trichlorobenzene											X	
1,2-Dichlorobenzene	X										X	
1,3-Dichlorobenzene	X										X	
1,4-Dichlorobenzene	X		X		X		X					
2,4-Dichlorophenol					X						X	
2,4-Dimethylphenol	X				X		X					
1-Methylnaphthalene							X				X	
2-Methylnaphthalene	X		X		X		X					
2-Methylphenol	X										X	
3,3' -Dichlorobenzidine												
4-Chloro-3-methylphenol												
4-Methylphenol	X		X									
4-Nitrophenol												
Acenaphthylene												
Acenaphthene	X		X									
Anthracene	X		X									
Benzo(a)anthracene					X							
Benzo(a)pyrene			X									
Benzo(b)fluoranthene												
Benzo(g,h,i)perylene												
Benzo(k)fluoranthene												
Benzoic acid												

Chemicals Detected in On-Source and Off-Source Media (Continued)

	On-Source Media						Off-Source Media				
Analyte	Groundwater	Zone 1 Groundwater	Zone 2 Water	Surface Soil	Surface Soil	Subsurface Soil	Surface Water	Leachate Seep1	Surface Sediment	Subsurface Sediment	Fish T issue
bis(2-Chloroethyl)ether											X
bis(2-Ethylhexyl)phthalate		X	X	X	X	X	X	X	X	X	X
Butylbenzylphthalate						X					
Carbazole							X	X	X	X	X
Chrysene				X	X	X	X	X	X	X	X
Di-n-butylphthalate			X			X			X		
Di-n-octylphthalate				X	X	X	X		X		
Dibenz(a,h)anthraene						X		X	X	X	X
Dibenzofuran	X		X	X		X	X		X	X	X
Diethylphthalate	X		X							X	
Dimethylphthalate						X					
Fluoranthene	X		X	X	X	X	X		X	X	X
Fluorene	X		X	X	X	X	X	X	X	X	X
Indeno(1,2,3-cd)pyrene						X	X		X	X	X
n-Nirtoso-diphenylamine	X					X	X	X			
n-Nitroso-di-n-propylamine					X						
Naphthalene	X		X	X	X	X	X		X	X	X
Pentachlorophenol						X					
Phenanthrene	X		X	X	X	X	X		X	X	X
Phenol	X		X				X		X	X	X
Pyrene			X	X	X		X	X	X	X	X
PCB/Pesticides											
4,4'-DDD							X	X	X	X	X
4,4'-DDE									X	X	X
4,4'-DDT							X		X		X
Aldrin							X	X	X	X	
Aroclor-1016							X		X		
Aroclor-1232									X		
Aroclor-1242							X	X			
Aroclor-1248							X				
Aroclor-1254							X	X	X		X
Aroclor-1260							X	X			
alpha-BHC										X	
beta-BHC			X				X		X	X	X
delta-BHC	X		X				X		X	X	X
gamma-BHC (Lindane)	X					X	X	X	X	X	
Dieldrin							X		X	X	X
Endosulfan I							X		X	X	
Endosulfan II			X						X	X	
Endosulfan sulfate						X				X	
Endrin									X	X	X
Endrin aldehyde		X				X				X	X
Endrin ketone							X	X		X	

Chemicals Detected in On-Source and Off-Source Media (Continued)

	On-Source Media							Off-Source Media			
Analyte	Groundwater	Zone 1 Groundwater	Zone 2 Water	Surface Soil	Surface Soil	Surface Soil	Subsurface Soil	Surface Water	Leachate Seep1	Surface Sediment	Subsurface Sediment	Fish Tissue
gamma-Chlordane												X
Heptachlor			X				X					X
Heptachlor expoxide	X						X		X			X
Methoxychlor												X
INORGANICS												
Aluminum	X		X		X		X		X		X	X
Antimony	X		X				X				X	X
Arsenic	X		X		X		X		X		X	X
Barium	X		X		X		X		X		X	X
Beryllium	X		X		X		X		X		X	X
Cadmium	X		X		X		X		X		X	X
Calcium	X		X		X		X		X		X	X
Chromium	X		X		X		X		X		X	X
Cobalt	X		X		X		X		X		X	X
Copper	X		X		X		X		X		X	X
Cyanide	X		X		X		X		X		X	X
Iron	X		X		X		X		X		X	X
Lead	X		X		X		X		X		X	X
Magnesium	X		X		X		X		X		X	X
Manganese	X		X		X		X		X		X	X
Mercury			X				X		X		X	X
Nickel	X		X		X		X		X		X	X
Potassium	X		X		X		X		X		X	X
Selenium			X				X		X		X	X
Silver								X				X
Sodium	X		X		X		X		X		X	X
Thallium	X		X				X		X		X	X
Vanadium	X		X		X		X		X		X	X
Zinc	X		X		X		X		X		X	X
CONVENTIONALS												
Ammonia Nitrogen	X	X										X

1Summary of on-source and off-source leachate seeps.

Table 6-1
Comparison Numbers Used for the Human Health Evaluation

Analyte	Soil/Sediment1 EPA 2	MTCA 3	Units	Surface water4	Units
VOCS					
1,1-Dichloroethane	200,000,000.00	32,000,000.00	ug/kg	N/A	ug/L
4-Methyl-2-Pentanone	N/A	N/A	ug/kg	N/A	ug/L
Acetone	200,000,000.00	32,000,000.00	ug/kg	N/A	ug/L
Benzene	200,000.00	1,400,000.00	ug/kg	71.00	ug/L
Butylbenzene	20,000,000.00	N/A	ug/kg	N/A	ug/L
Chlorobenzene	41,000,000.00	6,400,000.00	ug/kg	21,000.00	ug/L
Chloroethane	820,000,000.00	N/A	ug/kg	N/A	ug/L
Chloromethane	440,000.00	3,100,000.00	ug/kg	N/A	ug/L
cis-1,2-Dichloroethene	20,000,000.00	3,200,000.00	ug/kg	N/A	ug/L
Ethylbenzene	200,000,000.00	32,000,000.00	ug/kg	29,000.00	ug/L
Methylene Chloride	760,000.00	5,300,000.00	ug/kg	1,600.00	ug/L
Toluene	410,000,000.00	64,000,000.00	ug/kg	200,000.00	ug/L
Total Xylenes	1,000,000,000.00	640,000,000.00	ug/kg	N/A	ug/L
Trichloroethene	520,000.00	3,600,000.00	ug/kg	81.00	ug/L
BNAs					
1-Methylnaphthalene	N/A	N/A	ug/kg	N/A	ug/L
1,2-Dichlorobenzene	180,000,000.00	29,000,000.00	ug/kg	17,000.00	ug/L
1,2,4-Trichlorobenzene	20,000,000.00	3,200,000.00	ug/kg	N/A	ug/L
1,3-Dichlorobenzene	180,000,000.00	N/A	ug/kg	2,600.00	ug/L
1,4-Dichlorobenzene	240,000.00	1,700,000.00	ug/kg	2,600.00	ug/L
2-Methylnaphthalene	N/A	N/A	ug/kg	N/A	ug/L
2-Methylphenol	100,000,000.00	N/A	ug/kg	N/A	ug/L
2,4-Dichlorophenol	6,100,000.00	960,000.00	ug/kg	790.00	ug/L
2,4-Dimethylphenol	41,000,000.00	6,400,000.00	ug/kg	N/A	ug/L
3,3'-Dichlorobenzidine	13,000.00	89,000.00	ug/kg	0.077	ug/L
4-Chloro-3-methylphenol	N/A	N/A	ug/kg	N/A	ug/L
4-Methylphenol	10,000,000.00	N/A	ug/kg	N/A	ug/L
4-Nitrophenol	130,000,000.00	N/A	ug/kg	N/A	ug/L
Acenapthylene	N/A	N/A	ug/kg	N/A	ug/L
Acenapthene	120,000,000.00	19,000,000.00	ug/kg	N/A	ug/L
Anthracene	610,000,000.00	6,000,000.00	ug/kg	110,000.00	ug/L
Benz(a)anthracene	7,800.00	5,500.00	ug/kg	0.031	ug/L
Benzo(a)pyrene	780.00	5,500.00	ug/kg	0.031	ug/L
Benzo(b)fluoranthene	7,800.00	5,500.00	ug/kg	0.031	ug/L
Benzo(g,h,i)perylene	N/A	N/A	ug/kg	N/A	ug/L
Benzo(k)fluoranthene	78,000.00	5,500.00	ug/kg	0.031	ug/L
Benzoic acid	1,000,000,000.00	300,000,000.00	ug/kg	N/A	ug/L
bis(2-Chloroethyl)ether	5,200.00	36,000.00	ug/kg	1.40	ug/L
bis(2-Ethylhexyl)phthalate	410,000.00	2,900,000.00	ug/kg	5.90	ug/L
Butylbenzylphthalate	410,000,000.00	64,000,000.00	ug/kg	N/A	ug/L
Carbazole	N/A	2,000,000.00	ug/kg	N/A	ug/L
Chrysene	780,000.00	5,500.00	ug/kg	0.031	ug/L
Di-n-butylphthalate	200,000,000.00	32,000,000.00	ug/kg	12,000.00	ug/L
Di-n-octylphthalate	41,000,000.00	6,400,000.00	ug/kg	N/A	ug/L
Dibenz(a,h)anthracene	780.00	5,500.00	ug/kg	0.031	ug/L

Table 6-1 - page 2

	Soil/Sediment			Surface-water 4	
Analyte	EPA 2	MTCA 3	Units		Units
Dibenzofuran	8,200,000.00	N/A	ug/kg	N/A	ug/L
Diethylphthalate	1,000,000,000.00	260,000,000.00	ug/kg	120,000.00	ug/L
Dimethylphthalate	1,000,000,000.00	320,000,000.00	ug/kg	2,900,000.00	ug/L
Fluoranthene	82,000,000.00	13,000,000.00	ug/kg	370.00	ug/L
Fluorene	82,000,000.00	13,000,000.00	ug/kg	14,000.00	ug/L
lndeno(1,2,3-cd)pyrene	7,800.00	5,500.00	ug/kg	0.031	ug/L
n-Nitroso-di-n-propylamine	820.00	5,700.00	ug/kg	N/A	ug/L
n-Nitrosodiphenylamine	1,200,000.00	8,200,000.00	ug/kg	16.00	ug/L
Naphthalene	82,000,000.00	1,300,000.00	ug/kg	N/A	ug/L
Pentachlorophenol	48,000.00	330,000.00	ug/kg	8.20	ug/L
Phenanthrene	N/A	N/A	ug/kg	N/A	ug/L
Phenol	1,000,000,000.00	190,000,000.00	ug/kg	4,600,000.00	ug/L
Pyrene	61,000,000.00	9,600,000.00	ug/kg	11,000.00	ug/L
PCB/Pesticides					
4,4'-DDD	24,000.00	170,000.00	ug/kg	0.00084	ug/L
4,4'-DDE	17,000.00	120,000.00	ug/kg	0.00059	ug/L
4,4'-DDT	17,000.00	120,000.00	ug/kg	0.00059	ug/L
Aldrin	340.00	2,400.00	ug/kg	0.00014	ug/L
alpha-BHC	910.00	6,400.00	ug/kg	0.013	ug/L
Aroclor-1016	140,000.00	22,000.00	ug/kg	0.00005	ug/L
Aroclor-1232	740.00a	5,200.00a	ug/kg	0.00005	ug/L
Aroclor-1242	740.00a	5,200.00a	ug/kg	0.00005	ug/L
Aoclor-1248	740.00a	5,200.00a	ug/kg	0.00005	ug/L
Aroclor-1254	41,000.00	5,200.00a	ug/kg	0.00005	ug/L
Aoclor- 1260	740.00a	5,200.00a	ug/kg	0.00005	ug/L
beta-BHC	3,200.00	22,000.00	ug/kg	0.05	ug/L
delta-BHC	N/A	N/A	ug/kg	N/A	ug/L
gamma-BHC (Lindane)	4,400.00	31,000.00	ug/kg	0.063	ug/L
Dieldrin	360.00	2,500.00	ug/kg	0.00014	ug/L
Endosulfan I	12,000,000.00b	N/A	ug/kg	2.00	ug/L
Endosulfan II	12, 000,000.00b	N/A	ug/kg	2.00	ug/L
Endosultan sulfate	N/A	N/A	ug/kg	2.00	ug/L
Endrin	610,000.00	96,000.00	ug/kg	0.81	ug/L
Endrin aldehyde	N/A	N/A	ug/kg	0.81	ug/L
Endrin ketone	N/A	N/A	ug/kg	N/A	ug/L
gamma-chlordane	4,400.00c	30,800.00c	ug/kg	0.00059c	ug/L
Heptachlor	1,300.00	8,900.00	ug/kg	0.00021	ug/L
Heptachlor epoxide	630.00	4,400.00	ug/kg	0.00011	ug/L
Methoxychlor	10,000,000.00	1,600,000.00	ug/kg	N/A	ug/L
INORGANICS 5					
Aluminum	1,000,000.00	N/A	mg/kg	N/A	mg/L
Antimony	820.00	130.00	mg/kg	4.30	mg/L
Arsenic	3.80	57.00	mg/kg	0.00014	mg/L
Bairum	140,000.00	22,000.00	mg/kg	N/A	mg/L
Beryllium	1.30	9.30	mg/kg	N/A	mg/L
Cadmium	1,000.00	6.60	mg/kg	N/A	mg/L
Calcium	N/A	N/A	mg/kg	N/A	mg/L

	Soil/Sediment 1			Surface water 4	
Analyte	EPA 2	MTCA 3	Units		Units
Chromium	10,000.00d	1,600.00d	mg/kg	N/A	mg/L
Cobalt	120,000.00	N/A	mg/kg	N/A	mg/L
Copper	82,000.00	12,000.00	mg/kg	N/A	mg/L
Cyanide	41,000.00	6,400.00	mg/kg	220.00	mg/L
Iron	N/A	N/A	mg/kg	N/A	mg/L
Lead	400.00e	N/A	mg/kg	N/A	mg/L
Magnesium	N/A	N/A	mg/kg	N/A	mg/L
Manganese	10,000.00	45,000.00	mg/kg	N/A	mg/L
Mercury	610.00	96.00	mg/kg	0.00015	mg/L
Nickel	41,000.00f	6,400.00f	mg/kg	4.60	mg/L
Potassium	N/A	N/A	mg/kg	N/A	mg/L
Selenium	10,000.00	1,600.00	mg/kg	N/A	mg/L
Silver	10,000.00	1,600.00	mg/kg	N/A	mg/L
Sodium	N/A	N/A	mg/kg	N/A	mg/L
Thallium	N/A	22.00	mg/kg	0.0063	mg/L
Vanadium	14,000.00	2,200.00	mg/kg	N/A	mg/L
Zinc	610,000.00	96,000.00	mg/kg	N/A	mg/L

N/A Not Available

1 The lower of the two values (i.e., EPA or MTCA) was used for screening. This Table has been updated since the streamlined Risk Assessment to reflect recent (11995) revisions to the EPA Region 3 risk-based comparison numbers for soil. Only the soil comparison numbers have been updated.

2 Values taken from EPA Region III Risk-Based Concentration Table, Fourth Quarter 1994

3 Values taken from Washington State Department of Ecology's Model Toxics Control Act Cleanup Levels and Risk Calculations Update, January 1995

4 Values taken from EPA Water Quality Standards; 40 CFR Part 131-, December 1992

5 Regional background soil concentrations of arsenic and beryllium were also used for comparison. These values are 90th percentile concentrations obtained from the Washington State Department of Ecology (Ecology, 1994). The values used were the following:

Arsenic	7.3 mg/kg
Beryllium	0.6 mg/kg

a As "polychloAnated biphenyls"

b As "endosulfan"

c As "chlordane"

d As chromium VI

e Value taken from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities EPA OSWER Directive #9355.4-12, July, 1994

f As "nickel (soluble salts)"

g As "thallium, soluble salts"

Table 6-2
Summary of On-Source and Off-Source Site Data that Exceed
Human Health Comparison Numbers

Analyte	Frequency of Exceedences	Range of Exceed, Conc.	Criteria Concentration	Background Concentration	Units	Location of Samples that Exceeded Criteria
Surface Soil 1						
Aroclor-1242	2/106	1000-1900	740	N/A	ug/kg	R1SBSB05A1, R1SBSB09A1
Arsenic	91/93	4.8-47.3	3.8	7.3	mg/kg	Criteria was exceeded at all sample locations except: R1SBSB09D1 and R1SBSB091-S2 Background was exceeded at all locations except: R1SBSB08A1, R1SBSB08B1,1SBSB08C1,R1SBSB08D1, R1SBSB08E1, R1SBSB08F1, R1SBSB08G1, R1SBSB08I1, R1SBSB09A1, R1SBSB09D1, R1-SB-SB09A1-S2, R1SBSB02A1
Benzo(a)pyrene	3/106	1700-3300	780	N/A	ug/kg	R1SB-SB06A1-S2, R1SBSB06A1, R1SBSBO811
Beryllium	2/106	1.70-2.10	1.3	0.6	mg/kg	R1SBSB02C1, R1SBSB02I1
Chrysene	1/106	6000a	5500	N/A	ug/kg	R1SBSB0BI1
Heptachlor epoxide	1/106	2800	630	N/A	ug/kg	R1-SB-SB06A1-S2
Subsurface Soil 2						
Aroclor-1242	2/19	990-1100	740	N/A	ug/kg	R1SBSB05A2, R1SBS806A2,
Arsenic	17/17	4.2-32.4	3.8	7.3	mg/kg	Criteria was exceeded at all sample locations. Background was exceeded at all locations except: R1SBSB07A2 and R1SBSB09A2
Benzo(a)pyrene	3/20	990-1500	780	N/A	ug/kg	R1-SB-SB06A2-S2, R1SBSB06A2, R1SBSB06A3
Surface Water						
Arsenic	1/20	0.0018	0.00014	N/A	mg/L	R1-SW-SG24-S2
Dibenz(a,h)anthracene	1/20	0.04	0.031	N/A	ug/L	R1-SW-SG24-S2
Leachate						
3,3'- Dichlorobenzidine	1/55	0.4	0.077	N/A	ug/L	R3LSSP06
4,4'-DDD	1/33	0.022	0.00084	N/A	ug/L	R6LSSP06
4,4'-DDE	1/33	0.01	0.00059	N/A	ug/L	R6LSSP06
4.4'-DDT	9/36	0.013-0.049	0.00059	N/A	ug/L	R1LSSP09, R3LSSP03, R3LSSP05, R3LSSP06, R6LSSP02, R6LSSP03, R6LSSP06, R6LSSP10, R6LSSP08-S2

Analyte	Frequency of Exceedences	Range of Exceed. Conc.	Criteria Concentration	Background Concentration	Units	Location of Samples that Exceeded Criteria
Aldrin	9/37	0.007-0.036	0.00014	N/A	ug/L	R1LSSP03, R1LSSP09, R1LSSP11, R2LSSP08 R3LSSP06, R3LSSP09, R3LSSP10, R6LSSP08, R6LSSP10
Aroclor- 1016	10/36	0.47-1.2	0.000045	N/A	ug/L	R5LSSPO1, R5LSSP02, R5LSSP04, R5LSSP06, R5LSSP11, R6LSSP02, R6LSSP05, R6LSSP06, R6LSSP10, R6LSSPOS-S2
Aroclor-1232	8/37	1.2-5.8	0.000045	N/A	ug/L	R5-1-S-SP09-S2, R5LSSP03, R5LSSP05, R5LSSP08, R5LSSP09, R5LSSP10, R6LSSP07, R6LSSP08-S2
Aroclor-1254	1/37	1.31	0.000045	N/A	ug/L	R6SSP08-S2
Arsenic	40/59	0.0019-0.023	0.00014	N/A	mg/L	R1-LS-SP04-3/8, R1-LS-SP04-S2, R1LSSP01, R1LSSP02, R1LSSP03, R0SSP04, R1SSP05, R1LSSP06, R1LSSP07, R1LSSP08, R1LSSP11, R21-SSP01, R21-SSP03, R2LSSP05, R21-SSP07, R2LSSP08, R2LSSP11, R3LSSP05, R3LSSP06, R4-LS-SP06-S2, R4-LS-SP06-S2-F, R4LSSP03, R4LSSP05, 85LSSP01, R5LSSP03, R5LSSP04, R5LSSP05, R5LSSP06, R5LSSP08, R5LSSP11, R6LSSP01, R6LSSP02, R6LSSP03, R6LSSP04, R6LSSP05, R6LSSP06, R6LSSP07, R6LSSP08, R6LSSP11, R6LSSP08-S2
Benz(a)anthracene	3/55	0.27-5	0.031	N/A	ug/L	R1-LS-SP04-S2, R4-LS-SP06-S2, R4LSSP06
Benzo(a)pyrene	1/55	1.4	0.031	N/A	ug/L	R4-LS-SP06-S2
Benzo(b)fluoranthene	1/55	2.2	0.031	N/A	ug/L	R4-LS-SP06-S2
Benzo(k)fluoranthene	1/55	0.7	0.031	N/A	ug/L	R4-LS-SP06-S2
bis(2-Ethyhexyl)phthalate	3/56	6-23.4	5.9	N/A	ug/L	R1LSSP01, R4-LS-SP06-S2, R6-LS-SP08-S2
Chrysene	3/55	0.20-3.5	0.031	N/A	ug/L	R1-LS-SP04-S2, R4-LS-SP06-S2, R4LSSP06
Dibenz(a,h,)anthracene	1/55	0.08	0.031	N/A	ug/L	R4-LS-SP06-S2

Analyte	Frequency of Exceedences	Range of Exceed. Conc.	Criteria Concentration	Background Concentration	Units	Location of Samples that Exceeded Criteria
Dieldrin	6/35	0.006-0.02	0.00014	N/A	ug/L	R47SP06, R6LSSP03, R6LSSP04, R6LSSP06, R6LSSP08, R6LSSP11
Indeno(1,2,3-cd)pyrene	2/55	0.20-0.38	0.031	N/A	ug/L	R3LSSP03, R4-LS-SP06-S2.
gamma-BHC (Lindane)	1/39	0.067	0.063	N/A	ug/L	R1LSSP09
gamma-chlordane	1/33	0.006	0.00059	N/A	ug/L	R6LSSP11
Heptachlor	6/35	0.00899-0.022	0.00021	N/A	ug/L	R1LSSP11, R2LSSP08, R6LSSP02, R6LSSP04, R6LSSP06, R6LSSP10
Heptachlor epoxide	25/43	0.011-0.064	0.00011	N/A	ug/L	R1LSSP03, R1LSSP04, R1LSSP05, R1LSSP07, R2LSSP06, R3LSSP03, R3LSSP05, R3LSSP06, R3LSSP10, R4LSSP03, R4LSSP05, R4LSSP06, R4LSSP09, R4LSSP10, R6LSSP01, R6LSSP02, R6LSSP03, R6LSSP04, R6LSSP05, R6LSSP06, R6LSSP07, R6LSSP08, R6LSSP09, R6LSSP10, R6LSSP11
Mercury	4/50	0.00018-0.00038	0.00015	N/A	mg/L	R1LSSP08, R2LSSP08, R4-LS-SP06-S2 R5LSSP02
Thallium	1/33	0.0085	0.0063	N/A	mg/L	R6LSSP08
Surface sediment						
Arsenic	52/52	8.9-94.4	1.6	N/A	mg/kg	Criteria was exceeded at all sample locations
Benzo(a)pyrene	1/52	570	390	N/A	ug/kg	R1SDSG13
Manganese	1/52	9690	5100	N/A	mg/kg	R1SDSG19
Subsurface sediment						
Arsenic	20/20	8.8-60.9	1.6	N/A	mg/kg	Criteria was exceeded at all sample locations

a Value exceeded MTCA Method C criteria, but did not exceed EPA criteria

1 This table has been updated since the streamlined Risk Assessment to reflect recent (1995) revisions to the EPA Region 3 risk-based comparison numbers for soil. The resulting changes to this table are minor and do not change any of EPA's conclusions in or regarding the streamlined Risk Assessment. Changes in this table include: for site surface soil cJata, there are no exceedances of Region 3 risk-based soil comparison numbers for Aroclor-1248, benz(a)anthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene; the surface soil frequency of exceedance for six other chemicals changed slightly; for subsurface soils, there were slight changes in the reported frequencies of exceedance for some chemicals. However, no chemicals were removed from the list.

<IMG SRC 1096133B>
<IMG SRC 1096133B1>
<IMG SRC 1096133B2>

Table 6-4
Summary of On-Source Data that Exceed
Ecological Comparison Numbers

Analyte	Frequency of Exceedances 1	Range of Exceed. Conc.	Criteria Value	Units	Sample ID of Criteria Exceedances
Surface Soil					
bis(2-Ethyhexyl)phthalate	1/5	7200	6500	g/L	EE01-SS-P2
Surface Water					
Phenanthrene	1/5	14	6.3	g/L	EE01-SW-P1
Cadmium-total	1/5	0.011	0.0011	mg/L	EE01-SW-P3
Chromium-total	2/5	0.938-0.95	0.2	mg/L	EE01-SW-P1, EE01-SW-P2
Lead-total	2/5	0.428-0.486	0.0032	mg/L	EE01-SW-P1, EE01-SW-P2
Nickel-total	3/5	0.36-0.856	0.16	mg/L	EE01-SW-P1, EE01-SW-P3, EE01-SW-P4
bis(2-ethylhexyl)phthalate	1/5	180	160.0	ug/L	EE01-SW-P2
Copper-total	4/5	0.0145-0.337	0.012	mg/L	EE01-SW-P1, EE01-SW-P2, EE01-SW-P3, EE01-SW-P4
Iron-total	5/5	2.79-44.4	1.0	mg/L	EE01-SW-P1, EE01-SW-P2, EE01-SW-P3, EE01-SW-P4 EE01-SW-P5
Zinc-total	4/5	0.506-1.73	0.11	mg/L	EE01-SW-P1, EE01-SW-P2, EE01-SW-P3, EE01-SW-P4 EE01-SW-P5
Zone 1 Groundwater					
Chromium-total	1/4	0.165	0.05	mg/L	R1GWTB10
Chromium-dissolved	½	0.153	0.05	mg/L	R1GWTB10
Copper-total	2/4	0.0139-0.0395	0.0029	mg/L	R1GWMW23, R1GWTB10
Cyanide-total	2/4	0.011-0.016	0.001	mg/L	R1GWMW21, R1GWTB10
Lead-total	3/4	0.033-0.141	0.0085	mg/L	R1GWMW21, R1GWMW23, R1GWTB10
Nickel-total	1/4	0.0349	0.0083	mg/L	R1GWTB10
Nickel-dissolved	½	0.0277	0.0082	mg/L	R1GWTB10

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Analyte	Frequency of Exceedances1	Range of Exceed. Conc.	Criteria Value	Units	Sample ID of Criteria Exceedances
Zinc-total	2/4	0.0896-0.961	0.086	mg/L	R1GWMW21, R1GWTB10
Heptachlor Epoxide	2/4	0.027-0.049	0.0036	Ig/L	R1GWMW22, R1GWMW23
Phenanthrene	1/4	12	4.6	Ig/L	R1GWMW23
Ammonia nitrogen	4/4	12-94	0.035	mg/L	R1GWMW21, R1GWMW22, R1GWMW23, R1GWTB10
Zone 2 Groundwater					
Heptachlor	1/22	0.025	0.0036	Ig/L	R1GWMW14-S2
Endosulfan II	1/22	0.033	0.0087	Ig/L	R1GWMW14-S2
Zinc-total	1/87	0.1	0.086	mg/L	R1GWMW14-S2
Mercury-total	1/86	0.00021	0.000025	mg/L	R6GWMW08-S2
Copper-total	4/87	0.003-0.0069	0.0029	mg/L	R4GWMW02, R4GWMW08, R4GWTB06, R6GWMW08-S2
Chromium-total	12/87	0.066-0.984	0.05	mg/L	R1GWMW14-S2, R1GWMW14, R1GWMW15, R1GWTB06, R2GWTB06, R3GWMW07-S2, R3GWMW07-S2, R3GWMW07, R3GWTB06, R4GWTB06-S2, R4GWTB06,
Lead-total	8/87	0.0097-0.149	0.0085	mg/L	R1GWMW14-S2, R1GWMW14, R2GWMW04, R3GWT806, R6GWTB06, R6GWMW03, R6GWMW04, R6GWMW05
Cyanide-total	7/26	0.005-0.049	0.001	mg/L	R1GWMW14-S2, R1GWMW13, R1GWMW14, R1GWTB01, R1GWTB06, R2GWMW05-S2, R5GWTB03-S2
Nickel-total	26/87	0.0085-0.32	0.0083	mg/L	R1GWMW14-S2, R1GWMW08, R1GWMW14, R1GWMW15, R1GWTB06, R2GWMW03, R2GWMW08, R2GWTB06, R3GWMW05, R3GWMW07, R3GWMW08, R3GWMW09, R3GWTB03, R3GWTB06, R4GWTB06-S2, R4GWMW08, R4GWTB06, R5GWMW03, F5GWMW08, R5WMW10, R5GWTB03, R5GWTB06, R6GWMW08-SC, R6GWMW06, R6GWMW08, R6GWTB06
Phenanthrene	1/46	7	4.6	Ig/L	R1GWMW14-S2
Chromium-dissolved	5/11	0.115-0.645	0.05	mg/L	R1GWMW14, R1GWMW15, R4GWTB06-S2, R5GWTB06, R6GWTB06
Lead-dissolved	2/31	0.0088-0.0166	0.0056	mg/L	R6GWMW08, R6GWMW03

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Analyte	Frequency of Exceedances1	Range of Exceed. Conc.	Criteria Value	Units	Sample ID of Criteria Exceedances
Mercury-dissolved	1/30	0.00021	0.000025	mg/L	G6GWMW08-S2-F
Nickel-dissolved	9/31	0.01-0.286	0.0082	mg/L	R1GWMW14, R1GWMW15, R5GWMW08, F5GWMW09, R5GWTB03,R5GWTB06, R6GWMW08-S2-F, R6GWMW08, R6GWTB06
Zinc-dissolved	1/31	0.025	0.0081	mg/L	R6GWMW08-S2-F
Ammonia nitrogen	80/80	0.65-340	0.035	mg/L	All sample locations
Leachate Seep SP01					
Phenanthrene	4/4	8-12	6.3	Ig/L	R1LSSP01, R2SSP01, R5LSSP01. R6LSSP01
Iron-dissolved	4/4	15.3-21.7	1.0	mg/L	R1LSSP01, R2LSSP01, R5LSSP01, R6LSSP01
Lead-dissolved	2/2	0.0067-0.011	0.0025	mg/L	R5LSSP01, R6LSSP01
Cyanide-total	2/4	0.017-0.027	0.0052	mg/L	R5LSSP01, R6LSSP01
Iron-total	4/4	18.2-25.1	1.00	mg/L	R1LSSP01, R2LSSP01, R5LSSP01,R6LSSP01
Lead-Total	4/4	0.0456-0.0618	0.0032	mg/L	R1LSSP01, R2LSSP01, R5LSSP01, R6LSSP01
Heptachlor epoxide	½	0.013	0.0038	Ig/L	R6LSSP01
Aroclor-1016	½	1.2	0.014	Ig/L	R5LSSP01
Ammonia nitrogen	4/4	140-180	0.045	mg/L	R1LSSP01, R2LSSP01, R5LSSP01,. R6LSSP01

1 Note: The frequency of exceedances are based on the number off hits.

Table 6-5
Summary of Off-Source Data that Exceed
Ecological Comparison Numbers

Analyte Leachate	Frequency of Exceedances1	Range of Exceed. Conc.	Criteria Value	Background Conc.	Units	Sample ID of Criteria Exceedances
Fluoranthene	2/57	30-51.1	16	N/A	Ig/L	R4-LSSP06-S2, R4LSSP06
Phenanthrene	26/58	5-276	4.6	N/A	Ig/L	R1-LS-SP04-3/8, R1-LS-SP04-S2, R1LSSP03, R1LSSP04, R1LSSP06, R1LSSP07, R2LSSP03, RSLSSP04, R2LSSP06, R2LSSP07, R3LSSP03. R3LSSP06, R4-LSS-SP06-S2, R4LSSP03, R4LSSP06, R5LSSP03, R5LSSP04, R5LSSP06, R6LSSP03, R6LSSP04, R6LSSP06, R6LSSP07, R6LSSP08, R6LSSP02, R3LSSP00R1, R6LSSP00R1
Aldrin	10/41	0.007-0.036	0.0019	N/A	Ig/L	R1LSSP03, R1LSSP09, R1LSSP11, R2LSSP08, R3LSSP06, R3LSSP09, R3LSSP10, R6LSSP08, R6LSSP10, R3LSSP00R1
4,4'-DDT	10/38	0.013-0.049	0.001	N/A	Ig/L	R1LSSP09, R3LSSP03, R3LSSP05, R3LSSP06, R6-LSSP08-S2, R6LSSP02, R6LSSP03, R6LSSP06, R6LSSP10, R3LSSP00R1
Endrin	7/39	0.01-2-0.043	0.0023	N/A	Ig/L	R2LSSP08, R3LSSP06, R4LSSP05, R4LSSP06, R5LSSP03, R6LSSP02, R6LSSP08
Heptachlor	6/39	0.0089-0.022	0.0036	N/A	Ig/L	R1ILSSP11, R2LSSP08, R6LSSP02, R6LSSP04, R6LSSP06, R6LSSP10
Heptachlor epoxide	26/45	0.005-0.064	0.0036	N/A	Ig/L	R1LSSP03, R1LSSP04, R1LSSP05, R1LSSP07, R2LSSP06, R3LSSP03, R3LSSP05, R3LSSP06, R3LSSP10, R4LSSP03, R4LSSP05, R4LSSP06, R4LSSP09, R4LSSP10, R6LSSP11, R6LSSP05, R6LSSP06, R6LSSP07, R6LSSP08, R6LSSP09, R6LSSP10, R6LSSP04, R3LSSP00R1, R4LSSP00R1, R6LSSP02
Methoxychlor	2/37	0.049-0.071	0.03	N/A	Ig/L	R1LSSP09, R6LSSP06
Aroclor-1016	9/39	0.47-1.19	0.03	N/A	Ig/L	R5LSSP02, R5LSSP04, R5LSSP06, R5LSSP11, R6LSSP08-S2, R6LSSP02, R6LSSP05, R6LSSP06, R6LSSP10
Aroclor-1232	10/40	1-5.82	0.03	N/A	Ig/L	R5-LS-SP09-S2, R5LSSP03, R5LSSP05, R5LSSP08, R5LSSP09, R5LSSP10, R6-LSSP08-S2, R6LSSP07, R51LSSP00R1, R6SSP00R1
Aroclor-1254	1/40	1.31	0.03	N/A	Ig/L	R6LSSP08-S2
Chromium-total	19/60	0.0625-0.392	0.05	N/A	mg/L	R1LSP03, R1LSSP06, R1LSSP11, R2LSSP03, R2LSSP05, R2LSSP06, R2LSSP11, R3LSSP03, R3LSSP05, R3LSSP06, R3LSSP00R1, R4-LS-SP06-S2, R4LSSP03, R4LSSP05, R4LSSP06, R5LSSP03, R5LSSP06 R6LSSP03, R6LSSP06

Analyte	Frequency of Exceedances	Range of Exceed. Conc.	Criteria Value	Background Conc.	Units	Sample ID of Criteria Exceedances
Copper-total	25/60	0.0035-0.069	0.0029	N/A	mg/L	R1-LS-SP04-3/8, Rl-LS-SP04-S2, R1LSSP08, R1LSSP11, R2-LS-SP10-S2, R2LSSP03, R2LSSP04, R2LSSP05, R2LSSP08, R2LSSP11, R3LSSP03, R3LSSP05, R3LSSP06, R4-LS-SP06-S2, R4LSSP03, R4LSSP05, R5LSSP02, R5LSSP03, RSLSSP04, R5LSSP05, R5LSSP11, R5LSSP06, R6LSSP11, R6LSSP08-S2, R3LSSP00R1
Cyanide-total	13/5	30011-0.031	0.001	N/A	mg/L	R2LSSP06, R2LSSP08, R3LSSP05, R3LSSP06, R3LSSP09, R4LSSP03, R4LSSP09, R5LSSP02, R5LSSP03, R5LSSP05, R5LSSP06, R5LSSP11, R3LSSP00R1
Lead-total	43/60	0.00111-0-289	0.0085	N/A	mg/L	R1-LS-SP04-3/8, Rl-LS-SP04-S2, R1LSSP02, RISSP03, R1LSSP04, R1LSSP05, R1LSSP06, R1LSSP07, R1LSSP08, R1LSSP11, R2LSSP03, R2LSSP04, R2LSSP05, R2LSSP06, R2LSSP07, R2LSSP08, R2LSSP11, R3LSSP03, R3LSSP05, R3LSSP06, R4-LS-SP06-S2, R4LSSP06, R5LSSP01, R5LSSP02, R5LSSP03, R5LSSP04, R5LSSP05, R5LSSP06, R5LSSP08, R5LSSP11, R6LSSP08-S2, R6LSSP01, R6LSSP02, R6LSSP03, R6LSSP04, R6LSSP05, R6LSSP06, R4LSSP03, R4LSSP05, R6LSSP08, R6LSSP11, R3LSSP00R1, R6LSSP00R1, R6LSSP07
Mercury-total	4/52	0.00018-0.00038	0.000025	N/A	mg/L	R1LSSP08, R2LSSP08, R4-LS-SP06-S2, R5LSSP02
Nickel-total	35/60	0.0095-0.1	0.0083	N/A	mg/L	R1-LS-SP04-3/8, R1LSSP02, R1LSSP03, R1LSSP05, R1LSSP06, R1LSSP07, R1LSSP08, R1LSSP11, R2LSSP03, R2LSSP05, R2LSSP06, R2LSSP07, R2LSSP08, R2LSSP11, R3LSSP03, R3LSSP05, R3LSSP06, R4-LS-SP06-S2, R4LSSP03, R6LSSP11, R4LSSP05, R4LSSP06, R5LSSP02, R5LSSP03, R3LSSP05, R2LSSP06, R5LSSP08, R5LSSP11, R6LSSP02, R6LSSP03, R6LSSP05, R6LSSP06, R2LSSP07, R3-LSSP00R1, R6LSSP00R1
Zinc-total	24/60	0.0868-0.24	0.086	N/A	mg/L	R1LSSP03, RtLSSP08, R1LSSP11, R2LSSP03, R2LSSP05, R2LSSP06, R2LSSP08, R2LSSP11, R3LSSP03, R3LSSP05, R3LSSP06, R4-LS-SP06-S2, R4LSSP03, R4LSSP05, R4LSSP06, R5LSSP02, R5LSSP03, R5LSSP04, R5LSSP05, R5LSSP06, R5LSSP08, R5LSSP11, R6LSSP11, R3LSSP00R1
Dieldrin	6/39	0.006-0.02	0.0019	N/A	Ig/L	R4LSSP06, R6LSSP03, R6LSSP04, R6LSSP06, R6LSSP08, R6LSSP11
Endosulfan I	3/39	0.0089-0.016	0.0087	N/A	Ig/L	R4LSSP03, R4LSSP05, R6LSSP09
Chromium-dissolved	7/26	0.0688-0.32	0.05	N/A	mg/L	R4-LSSP06-S2-F, R4LSSP03, R4LSSP05, R4LSSP06, R5LSSP03, R5LSSP06, R6LSSP06

Analyte	Frequency of Exceedances	Range of Exceed. Conc.	Criteria Value	Background Conc.	Units	Sample ID of Criteria Exceedances
Copper-dissolved	6/23	0016-0.0509	0.0024	N/A	mg/L	R4-LS-SP06-S2-F, R4LSSP03, R4LSSP05, R5LSSP05 R5LSSP06, R5LSSP11
Lead-dissolved	6/26	0.0057-0.0353	0.0056	N/A	mg/L	R4-LS-SP06-S2-F, R4LSSP06, R5LSSP05, R5LSSP06 R6LSSP06, R6LSSP11
Nickel-dissolved	14/19	0.0086-0.11	0.0082	N/A	mg/L	R4LSSP06-S2-F, R4LSSP05, R4LSSP06, R5LSSP05, R5LSSP06, R5LSSP08, R5LSSP11, R6LSSP02, R6LSSP03, R6LSSP05, R6LSSP06, R6LSSP07, R6LSSP08, R6LSSP11
Zinc-dissolved	9/26	0.012-0.147	0.0081	N/A	mg/L	R4LSSP03, R4LSSP06, R5-LSSP09-S2-F, R5LSSP02, R5LSSP05 R5LSSP06, R5LSSP08, R5LSSP11, R6-LS-SP08-S2-F
Ammonia nitrogen	46/46	27-180	0.035	N/A	mg/L	All sample locations
gamma-chlordana	1/36	0.006	0.004	N/A	Ig/L	R6LSSP11
Surface Soil						
2-Methylnaphthalene	13/106	72-68000	2.6	N/A	Ig/kg	R1-SB-SB01C1-S2, R1-SB-SB04A1-S2, R1-SB-SB06AI S2, R1 SB-SB08Al-S2, R1-SB-SB09A1S2, R1SBSB02A1, R1SBSB03A1, R1SBSB04A1. R1SBS906A1, R1SBSB08A1, R1SBSB08B1, R1SBSB08C1, R1SBSB09A1
Acenaphthene	5/106	1300-41200	1100	N/A	Ig/kg	R1-SB-SB06A- S2, R1-SB-SB09A1-S2, R1SBSB02A1, R1SBSB06A1 R1SBSB09A1
bis(2-Ethyhexyl)phthalate	4/106	7600-14300	6500	N/A	Ig/kg	R1-SB-SB06A1-S2-R1, R1-SB-SB08A1-S2, R1SBSBB05G1, R1SBSB089A1
Fluorene	6/106	100-44200	1100	N/A	Ig/kg	R1-SB-SB06A1-S2, R1-SB-SB09A1-S2, R1SBSB02A1, R1SBSB06A1. R1SBSB09A1, R1SBSB09D1
Naphthalene	4/106	7300-64700	3900	N/A	Ig/kg	R1-SB-SB06A1-S2, R1-SB-SB09A1-S2, R1SBSB06A1, R1SBSB09Al
Phenanthrene	2/106	84000-105000	20000	N/A	Ig/kg	R1-SB-SB06A1-S2, R1SBSB06A1
Aroclor-1242	4/106	470-1900	170	N/A	Ig/kg	R1SBSB05A1, R1SBSB06A1, R1SBSB09A1, R1SBSB09D1
Aroclor-1260	3/106	340-1100	170	N/A	Ig/kg	R1-SB-SB08A1-S2, R1SBSB06A1, R1SBSB08A1
4,4'-DDT	1/106	110	6.5	N/A	Ig/kg	R1-SB-SB08A1-S2

Analyte	Frequency of Exceedances	Range of Exceed. Conc.	Criteria Value	Background Conc.	Units	Sample ID of Criteria Exceedances
Aluminum	106/106	2640-33800	50	32,581	mg/kg	All sample locations exceed criteria value. However, all locations except one were below background.
Arsenic	11/93	30.6-47.3	30	7.30	mg/kg	R1SBSB0lEl, R1SBSB01G1, R1SBSB02l1, R1SBSB06B1, R1SBSB06C1, R1SBSB06D1, R1SBSB06E1, R1SBSB06F1, R1SBSB06H1, R1SBSB06l1, R1SBSB07El
Barium	3/106	788-1650	500	N/A	mg/kg	R1-SB-SB09Al-S2, R1SBSB09A1, R1SBSB09D1
Chromium	2/106	151-174	100	48.15	mg/kg	R1-SB-SB06A1-S2, R1SBSB06A1
Cobalt	1/106	97.7	50	N/A	mg/kg	R1SBSB02l1
Copper	2/106	129-35	100	36.36	mg/kg	R1SBSB02C1, R1SBSB02l1
Lead	7/106	223-335	200	16.83	mg/kg	R1-S8-S808Al-S2, R1SBSB02A1, R1SBSB04D1, R1SBSB05A1, R1SBSB05G1, R1SBSB08A1, R1SBSB08F1
Manganese	10/106	1230-3620	1200	1146	mg/kg	R1SBSB02E1, R1SBSB02l1, R1SBSB05H1, R1SBSB06C1, R1SBSB06G1, R1SBSB06H1, R1SBSB07B1, R1SBSB07D1, R1SBSB07E1, R1SBSB07l1
Vanadium	45/106	60.3-78.9	60	N/A	mg/kg	R1-SB-SB01C1-S2, R1-SB-SB02D1-S2, R1-SB-SB06A1-S2, R1-SB-SB07H1-S2, R1-SB17-S2, R1SBSB01C1, R1SBSB01D1, R1SBSB01E1, R1SBSB01F1, R1SBSB01G1, R1SBSB0lH1, R1SBSB02B1, R1SBSB02C1, R1SBSB02D1, R1SBSB02G1, R1SBSB02H1, R1SBSB02l1, R1SBSB03Hl, R1SBSB04Cl, R1SBSB06A1, R1SBSB06B1, R1SBSB06C1, R1SBSB06D1, R1SBSB06E1, R1SBSB06F1, R1SBSB06G1, R1SBSB06H1, R1SBSB06l1, R1SBSB07B1, R1SBSB07C1, R1SBSB07D1, R1SBSB07E1, R1SBSB07F1, R1SBSB07l1, R1SBSB08E1, R1SBSB09E1, R1SBSB09F1, R1SBSB09G1, R1SBSB09l1, R1SBSB1101, R1SBSB1301, R1SBSB1401, R1SBSB1601, R1SBSB2001, R1SBSB2201

Analyte	Frequency of Exceedances	Range of Exceed. Conc.	Criteria Value	Background Conc.	Units	Sample ID of Criteria Exceedances
Zinc	84/106	2640-33800	67	85.06	mg/kg	R1-SB-SB01C1-S2, R1-SB-SB02D1-S2, R1-SB-SB03B1-S2, R1-SB-SB07H1-S2, R1-SB-SB08A1-S2, R1-SB-SB09A1-S2, R1-SBSB04A1-S2, R1-SB-SB0A1-S2, R1-SB-SB17-S2, R1-SBSB01A1, R1SBSB01B1, R1SBSB0lCl, R1SBSB01D1, R1-SB-R1SBSB01E1, R1SBSB01F1, R1SBSB0lG1, R1SBSB01H1, R1SBSB01ll, R1SBSB02A1, R1SBSB02B1, R1SBSB02C1, R1SBSB02D1, R1SBSB02E1, R1SBSB02F1, R1SBSB02G1, R1SBSB02H1, R1SBSB02l1, R1SBSB03C1, R1SBSB03D1, R1SBSB03E1, R1SBSB03F1, R1SBSB03G1, R1SBSB03H1, R1SBSB04B1, R1SBSB04C1, R1SBSB04D1, R1SBSB04E1, R1SBSB04F1, R1SBSB04H1, R1SBSB05A1, R1SBSB05B1, R1SBSB05D1, R1SBSB06A1, R1SBSB06B1, R1SBSB06C1, R1SBSB06D1, R1SBSB06E1, R1SBSB06F1, R1SBSB06G1, R1SBSB06H1, R1SBSB06l1, R1SBSB07B1, R1SBSB07C1, R1SBSB07D1, R1SBSB07E1, R1SBSB07Fl, R1SBSB07G1, R1SBSB07H1, R1SBSB07l1, R1SBSB08A1, R1SBSB08C1, R1SBSB08E1, R1SBSB08F1, R1SBSB09Al, R1SBSB09B1, R1SBSB09C1, R1SBSB09E1, R1SBSB09F1, R1SBSB09G1, R1SBSB09l1, R1SBSB1101, R1SBSB1201, R1SBSB1301, R1SBSB1401, R1SBSB1501, R1SBSB1601, R1SBSB1701, R1SBSB1901, R1SBSB2001, R1SBSB2101, R1SBSB2201, R1SBSB2301, R1SBSB2401, R1SBSB2501
Subsurface soil						
2-Mathyinaphthalene	13/20	34-72000	2.6	N/A	Ig/kg	R1-SB-SB004A2-S2, R1-SB-SB06A2-S2, R1SBSB03A2, R1SBSB03A3, R1SBSB03A4, R1SBSB04A2, R1SBSB04A3, R1SBSB06A2, R1SBSB06A3, R1SBSB06A4, R1SBSB03A2, R1SBSB09A3, R1SBSB09A4
Acenaphthylene	1/20	10000	1100	N/A	Ig/kg	R1-SB-SB06A2-S2
Acenaphthane	7/20	1100-42900	1100	N/A	Ig/kg	R1-SB-SB06A2-S2, R1SBSB03A2, R1SBS603A3, R1SBSB03A4, R1SBSB06A2, R1SBSB06A3, R1SBSB06A4
bis(2-Ethylhexyl)phthalate	1/20	10100	6500	N/A	Ig/kg	R1-SB-SB06A2-S2
Fluorene	6/20	1200-46500	1100	N/A	Ig/kg	R1-SB-SB06A2-S2, R1SBSB03A3, R1SBSB03A4, R1SBSB06A2, R1SBSB6A3, R1SBSB06A4
Naphthalene	6/20	4000-85300	3900	N/A	Ig/kg	R1SB-SB06A2-S2, R1SBSB03A3, R1SBSB03A4, R1SBSB06A2, R1SBSB06A3, R1SBSB06A4

Analyte	Frequency of Exceedances	Range of Exceed. Conc.	Criteria Value	Background Conc.	Units	Sample ID of Criteria Exceedances
Phenanthrene	4/20	41000-120000	20000	N/A	I/kg	R1-SB-SB06A2-S2, R1SBSB06A2, R1SBSB06A3, R1SBSB06A4
Aroclor-242	8/19	180-1100	170	N/A	Ig/kg	R1SBSB05A2, R1SBSB05A3, R1SBSB05A4, R1SBSB06A2, R1SBSB06A3, R1SBSB06A4, R1SBSB09A3, R1SBSB09A4
Aroclor-1260	1/20	200	170	N/A	Ig/kg	R1SBSB06A4
Aluminum	20/20	11900-23100	50	32,581	mg/kg	All sample locations exceeded criteria value. However, all locations were below background.
Arsenic	3/17	31-32.4	30	7.30	mg/kg	R1SBSB06A2, R1SBSB06A3, R1SBSB06A4
Chromium	3/20	109-150	100	48.15	mg/kg	R1-SB-SB06A2-S2, R1SBSB06A2, SBSB06A3
Vanadium	5/20	61.7-78.7	60	N/A	mg/kg	R1-SB-SB04A2-S2, Rl-SB-SB06A2-S2, R1SBSB05A4, R1SBSB06A2, R1SBSB06A4
Zinc	13/20	68.3-150	67	85.06	mg/kg	R1-SB-SB04A2-S2, R1-SB-SB06A2-S2, R1SBSB04A2, R1SBSB05A2, R1SBSB05A3, R1SBSB05A4, R1SBSB06A2, R1SBSB06A3, R1SBSB06A4, R1SBSB07A4, R1SBSB09A2, R1SBSB09A3, R1SBSB09A4

Analyte	Frequency of Exceedances	Range of Exceed. Conc.	Criteria Value	Background Conc.	Units	Sample ID of Criteria Exceedances
Surface Water						
Lead	1/20	0.011	0.0085	N/A	mg/kg	R1SWSG37
Surface Sediment						
4-Methylphenol	6/52	730-3000	670	N/A	Ig/kg	R1-SD-SG10-S2, R1-SD- SG32-S2, R2SDSG05, R1SDSG11, R1SDSG20, R1SDSG21
Fluoranthene	1/52	4700	2500	N/A	Ig/kg	R1SDSG13
Phenol	10/52	440-1400	420	N/A	Ig/kg	R1SDSG01, R1SDSG06, R1SDSG09, R1SDSG10, R1 SDSG11, R1SDSG14, R1SDSG15, R1SDSG16, R1SDSG17, R1SDSG18
Arsenic	1/52	94.4	57	N/A	mg/kg	R1SDSGI9
Chromium	1/52	300	260	N/A	mg/kg	R1SD-SG08-S2
Nickel	1/52	381	140	N/A	mg/kg	R1-SD-SG08-S2
Subsurface Sediment						
Fluoranthene	2/20	3300-8100	2500	N/A	Ig/kg	R1SDSG2802, R1SDSG2804
Pyrene	1/20	4100	3300	N/A	Ig/kg	R1SDSG2802
Arsenic	1/20	60.9	57	N/A	mg/kg	R1SDSG1902

Table 9-1

Cost Estimate Comparisons1
(in millions of dollars)

Respondents Cost Estimate2	EPA Cost Estimate	Alternative
-----	$1.0	1 - No Action
-----	$5.9	2 - Active Seep Interception
$13.3	$21.3	2b - Leachate Collection with Discharge to Treatment Berm
$11.8	$20.8	2b(ii) - Leachate Collection with Discharge to P0TW
-----	$22.0	3 - Leachate Seep and Ground Water Collection and Treatment
-----	$22.1	4a - Soil Cover with Passive Drainage
$18.6	$21.3	4b - Geosynthetic Cover with Active Drainage
$22.4	$25.1	4c - Geosynthetic Cover with Passive Drainage
$27.1	$29.8	4d - Composite Cover with Passive Drainage
$25.6	$28.3	5 - Geosynthetic Cover with Leachate Seep Control
$36.0	$38.7	6 - Geosynthetic Cover with Leachate Seep and Zone 2 Ground Water Collection/Treatment

1 Alternatives that meet the NCP threshold criteria are in shown in bold type. Cost estimates include capital costs and operations and maintenance (0&M) costs, calculated using a 5% discount rate over 30 years.

If different than EPA's cost estimate.

Table 10 -1
Cost Estimate for Alternative 4c
Geosynthetic Cover with Passive Drainage

Item	Qty	Units	Unit Cost	Cost#	Notes
Capital Costs					
Deed modification		LS		$5,000	
Monitoring plan		LS		$50,000	
Well abandonment		LS		$30,000	
Transportation improvement		LS		$250,000	
Cleaning and grubbing	147	acre	$3,500	$514,000	
Passive Grading Plan:					
Regrade onsite soil	300,000	cy	$2.00	$600,000	
Re-grade waste	140,000	cy	$3.00	$420,000	
Import soil	400,000	cy	$10.00	$4,000,000	
Surface Water Controls:					
Perimeter road/drainage ditch	12,000	ft	$25.00	$300,000	
Perimeter sumps	20	sump	$6,000	$120,000	
Wetlands Mitigation	1.1	acre	$10,000	$11,500	2,500 ft# per outfall
Cover:					
Gas system	11,000	ft	5.00	$55,000	
Establish vegetation	147	acre	$1,500	$220,200	
Vegetative layer (import soil)	237,000	cy	$12.00	$2,844,000	1 ft thick
Edgedrain	130,000	ft	$5.00	$650,000	
Geotextile	6,400,000	sf	$0.15	$960.000	
Flexible membrane liner (FML)	6,400,000	sf	$0.40	$2,560,000	
Subtotal Capital Costs				$13,589,700	
Contractor overhead and profit			10%	$1,359,000	
Engineering			8%	$1,087,000	
Construction surveillance			3%	$408,000	
Contingency			25%	$3,397,000	
Total Capital Costs				$19,841,000	

Operation and Maintenance (O&M) Costs					
Cover maintenance		yr		$72,000	
Surface water controls maintenance		yr		$12,000	
Annual groundwater monitoring costs		yr		$50,000	
Subtotal O&M Costs				$134,000	
Contingency			25%	$34,000	
Annual O&M Costs				$168,000	
Net Present Value of O&M Costs	30	yr	$168,000	$3,763,000	
Net discount rate = 2%					
Net Present Value of O&M Costs	30	yr	$168,000	$2,583,000	
Net discount rate = 5%					
Total Alternative Cost (Net Present Value)b				$23,604,000	Net discount rate = 2%
Total Alternative Cost (Net Present Value)b				$2,424,000	Net discount rate = 5%

a Costs are for mid-1994. Some costs are rounded

b The sum of capital costs and the net present value of operations and maintenance costs.

Table 11-1 Chemical-Specific ARARs for Surface Water at the Tulalip Landfill Site1

Analyte	Concentration (mg/L)	Criteria	Reference2,3,4
VOCs			
1,1-Dichlorethane	0.0032	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Benzene	0.071	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Chlorobenzene	0.129	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Chloroform	0.47	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Chloromethane	6.4	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Ethylbenzene	0.43	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
Methylene Chloride	1.6	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Toluene	5	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Trichloroethene	0.081	HH - Federal Fish Consumption	40 CFR Part 131, 1992
BNAs			
1,2-Dichlorobenzene	1.97	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
1,3-Dichlorobenzene	1.97	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
1,4-Dichlorobenzene	1.97	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
2-Methylnaphthalene	0.3	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
2,4-Dichlorophenol	0.97	HH - Federal Fish Consumption	40 CFR Part 131, 1992
3,3'-Dichlorobenzidine	0.000077	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Acenaphthylene	0.3	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
Acenapthene	0.71	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Anthracene	0.3	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
Benzo(a)anthracene	0.000031	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Benzo(a)pyrene	0.000031	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Benzo(b)fluoranthene	0.000031	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Benzo(g,h,i)perylene	0.3	Eco - Marine AWQC acute	40 CFR Part 131, 1992
Benzo(k)fluoranthene	0.000031	HH - Federal Fish Consumption	40 CFR Part 131, 1992
bis(2-Chloroethyl)ether	0.0014	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Bis(2-Ethylhexyl)phthalate	0.0059	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Chrysene	0.000031	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Di-n-butylphthalate	12	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Dibenz(a,h)anthracene	0.000031	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Diethylphthalate	120	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Fluoranthene	0.016	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Fluorene	0.3	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
n-Nitrosdiphenylamine	0.016	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Naphthalene	2.35	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
Pentachlorophenol	0.0079	Eco - WA State Marine chronic	WAC 173-201A
Phenanthrene	0.0046	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Phenol	5.8	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
Pyrene	0.3	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995

PCBs/Pesticide			
4,4'-DDD	0.00000084	HH - Federal Fish Consumption	40 CFR Part 131, 1992
4,4'-DDE	0.00000059	HH - Federal Fish Consumption	40 CFR Part 131, 1992
4,4'-DDT	0.00000059	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Aldrin	0.00000014	HH - Federal Fish Consumption	40 CFR Part 131, 1992
alpha-BHC	0.000013	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Aroclor-1016	0.000000045	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Aroclor-1232	0.000000045	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Aroclor-1242	0.000000045	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Aroclor-1248	0.000000045	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Aroclor-1254	0.000000045	HH - Federal Fish Consumption	40 CFR Part 131, 1992
Aroclor-1260	0.000000045	HH - Federal Fish Consumption	40 CFR Part 131, 1992
beta-BHC	0.000046	HH - Federal Fish consumption	40 CFR Part 131, 1992
Chlordane	0.00000059	HH - Federal Fish consumption	40 CFR Part 131, 1992
delta-BHC	0.00034	Eco - Marine AWQC acute	40 CFR Part 131, 1992; 1995
Dieldrin	0.00000014	HH - Federal Fish consumption	40 CFR Part 131, 1992
Endosulfan I	0.0000087	Eco - WA State Marine chronic	WAC 173-201A
Endosulfan II	0.0000087	Eco - WA State Marine chronic	WAC 173-201A
Endosulfan Sulfate	0.002	HH - Federal Fish consumption	40 CFR Part 131, 1992
Endrin	0.0000023	Eco - WA State Marine chronic	WAC 173-201A
Endrin aldehyde	0.00081	HH - Federal Fish consumption	40 CFR Part 131, 1992
gamma-BHC (Lindane)	0.000063	HH - Federal Fish consumption	40 CFR Part 131, 1992
Heptachlor	0.00000021	HH - Federal Fish consumption	40 CFR Part 131, 1992
Heptachlor epoxide	0.00000011	HH - Federal Fish consumption	40 CFR Part 131, 1992
Methoxychlor	0.00003	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
INORGANICS5			
Antimony	0.5	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Arsenic	0.00014	HH - Federal Fish consumption	40 CFR Part 131, 1992
Cadmium	0.0093	Eco - WA State Marine chronic	WAC 173-201A
Chromium (VI)	0.05	Eco - WA State Marine chronic	WAC 173-201A
Copper	2.40E-03/2.90E-03	Eco - Mar. AWQC Chronic/Wa State Mar. Acute	40 CFR Part 131, 1995/WAC 173-201A
Cyanide	0.001	Eco - WA State Marine chronic	WAC 173-201A
Lead	0.0056/0.0085	Eco - Marine AWQC chronic	40 CFR Part 131, 1992; 1995
Mercury	0.000025	Eco - Marine AWQC chronic	WAC 173-201A
Nickel	0.0079/8.30E-03	Eco - Marine AWQC chronic	WAC 173-201A
Selenium	0.071	Eco - Marine AWQC chronic	WAC 173-201A
Silver	0.0023	Eco - Marine AWQC acute	WAC 173-201A
Thallium	0.0065	HH - Federal Fish consumption	40 CFR Part 131, 1992
Zinc	0.076/0.086	Eco - WA State Marine chronic	WAC 173-201A
CONVENTIONALS			
Ammonia6	0.035	Eco - WA State Marine chronic	WAC 173-201A

1 During detailed design, EPA may select a subset of the surface water ARARs for the purpose of monitoring the interim remedy. EPA plans to adjust compliance levels for these surface water ARARS, if appropriate, to account for practical quantization limits (PQLs) and for surface water background concentrations.
2 Values taken from EPA Water Quality Standards 40 CFR Part 131, December, 1992 for the protection fo human health from ingestion of seafood. The National Toxics Rules allows these Federal criteria to be used as state standards.
3 Values taken from EPA Water Quality Standards 40 CFR Part 131, December, 1992 and EPA Interim Final Standards, 1995 for the protection of aquatic organisms.
4 Values taken from the Washington State WAC 173-201A for the protection of aquatic life.
5 AWQC criteria for inorganic are the same for dissolved or total metals except where a slash indicated otherwise. In this case the first value is the dissolved criteria value. Translation from total to dissolved metals based on WAC 173-201A calculations.
6 Assume conversion factor of 1.2 from ammonia-N to total ammonia and 5% of total ammonia is un-ionized ammonia.
All AWQC calculations are based on a pH of 7.8 and a hardness of 100 ppm of CaCO3, which is reasonable because these are within ranges that have been measure at the site.

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Appendix C:
Guidance Documents for the
Landfill Cover System

Solid Waste Landfill Design Manual, June 1987, Publication NO.87-13. Prepared by Parametrix, Inc. for Washington Department of Ecology.

Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047.

Technical Guidance Document: The Fabrication of Polyethylene FML Field Seams, EPA/530/SW-89-069.

Seminar Publication Design and Construction of RCRA/CERCLA Final Covers, EPA/625/4-91/025.

Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams, EPA/530/SW-91/O51.

Solid Waste Disposal Facility Criteria Technical Manual, EPA 530-R93-017.

Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities, EPA/600/R-93/182.

Report of Workshop on Geosynthetic Clay Liners, EPA/600/R-93/171.

Proceedings of the Workshop on Geomembrane Seaming Data Acquisition and Control, EPA/600/R-93/112.

The Hydrologic Evaluation of Landfill Performance (HELP) Model User's Guide for Version 3, EPA/600/R-94/168a.

The Hydrologic Evaluation of Landfill Performance (HELP) model Engineering Documentation for Version 3, EPA/600/R-94/168b.

APPENDIX D

RESPONSIVENESS SUMMARY
TULAIP LANDFILL

TABLE OF CONTENTS

LIST OF COMMENTORS

As part of the formal remedy selection process, public comments were solicited on EPA documents related to the Proposed Plan for Interim Remedial Action at the Tulalip Landfill. All public comments received are contained in the following documents:

1. Transcript from the Public Meeting of August 22, 1995
2. Transcript from the Public Meeting of October 3, 1995
3. AOC Respondents Comments on EPA's Proposed Plan for Interim Remedial Action at the Tulalip Landfill
4. Letter from Snohomish Health District
5. Letter from Balance Council
6. Letter from Sato Corporation
7. Letter from NW Indian Fisheries Commission
8. Letter from Lake Union Drydock Company
9. Letter from Achilles USA Inc.
10. Letters from the Tulalip Tribes
11. Letter from People for Puget Sound
12. Comment sheet from Mark Lindberg
13. Letter from Fog-Lite
14. Letter from Buffalo Industries
15. Telephone logs from unidentified private citizens
16. Letter from Pilchuck Audubon Society
17. Letter from Crow Roofing and Sheet Metal, Inc.
18. Letter from Marco Shipyard

TERMS COMMONLY USED IN THE RESPONSIVENESS SUMMARY

The following is a list of terms and unique definitions as used throughout the Responsiveness Summary. EPA is including these definitions for purposes of clarity.

a. source or on-source area -- is considered to include approximately 147 acres of waste, groundwater in and beneath the waste, cover material and the surrounding perimeter landfill berm.

b. off-source area -- is considered to include any part of the Site that is located outside the perimeter berm.

c. streamlined baseline risk assessment -- refers to the risk assessment performed for the on-source area of the Tulalip Site as part of the remedial investigation and remedy selection process (i.e., the RI/FS). In the Proposed Plan and the Risk Assessment for Interim Remedial Action, EPA referred to the risk assessment and its process as a "screening" assessment. After evaluating public comments on the Proposed Plan, it is apparent that some commentors were misled by EPA's use of the phrase "screening" to refer to the risk assessment process used for evaluating the on-source area of the Tulalip Site. Therefore, EPA is now more appropriately and accurately referring to the risk assessment for the source area as a Streamlined Risk Assessment, rather than a screening level risk assessment. The Streamlined Risk Assessment has been completed.

d. comprehensive baseline risk assessment (CBRA) -- refers to the risk assessment for the off-source area of the Tulalip Site. This risk assessment is ongoing.

e. interim (action) ROD -- refers to the remedial action decision document for the on-source area of the Site.

f. cap/cover -- refers to a component of the selected remedial action. A cap or cover are terms used to describe a method of containment which employs a covering or cap to prevent contact exposure or infiltration of precipitation.

g. Zone 1 aquifer -- refers to the leachate mound which has accumulated in the refuse layer. When precipitation falls on the landfill, most of the rainwater infiltrates down through the soil cover and sinks down into the refuse layer, picking up contamination from the waste as it moves through. A discontinuous silt layer underlies the refuse and the Zone 1 aquifer throughout much of the landfill.

h. Zone 2 -- refers to the groundwater under Zone 1 and the discontinuous silt layer.

i. comparison numbers -- refers to established standards and criteria, and calculated risk-based chemical concentrations, that are generally considered to be protective of human health and the environment. Most of these comparison numbers, with the exception of ecological soil risk-based concentrations, have been established or developed under federal or state law.

After evaluating public comments on the Proposed Plan, it is apparent to EPA that some commentors were mislead by EPA's use of the phrase "screening criteria" in the Streamlined Risk Assessment to refer to standards, criteria and risk-based chemical concentrations used in the Streamlined Risk Assessment. To clarify this issue, EPA is using a more accurate phrase "comparison numbers" to refer to standards, criteria and risk-based chemical concentrations. EPA notes that these comparison numbers have been selected for use in the Streamlined Risk Assessment for the purpose of evaluating potential risks posed by the Site. These comparison numbers are not necessarily ARARs.

j. AOC Respondents -- generally refers to the Potentially Responsible Parties (PRPs) who signed the RI/FS Administrative order on Consent, dated August 1993.

LIST OF ACRONYMS USED IN THIS DOCUMENT

AET	Apparent Effects Threshold
AMBS	Area of Major Biological Significance
AOC	Administrative Order on Consent
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
AWQC	Ambient Water Quality Criteria
BIA	Bureau of Indian Affairs
CBRA	Comprehensive Baseline Risk Assessment
CCMP	Comprehensive Coastal Management Plan
C.F.R.	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FML	Flexible Membrane Liner
FS	Feasibility Study
FWQC	Federal Water Quality Criteria
MCC	Marine Chronic Criteria
MFS	Minimal Functional Standards (Washington State MFS regulations for landfill closure)
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
NEP	National Estuary Program
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Treatment Works
PP	Proposed Plan
PRPS	Potentially Responsible Parties
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objectives
RBC	Risk-Based Concentrations
RCW	Revised Code of Washington
RI	Remedial Investigation
ROD	Record of Decision
REAC(Weston)	Response Engineering and Analytical Contract
SDC	Seattle Disposal Company
SRA	Streamlined Baseline Risk Assessment
SMS	Sediment Management System
SQS	Sediment Quality Standards
TOC	Total Organic Content
TRV	Toxicity Reference Value
WAC	Washington Administrative Code
WQS	Water Quality Standards
U.S.C.	United States Code

RESPONSIVENESS SUMMARY
FOR THE
TULALIP LANDFILL
INTERIM ROD

1.0 OVERVIEW

This section provides a "roadmap" of the Agency's decision making process regarding the interim remedial action at the Tulalip Landfill and a brief discussion of the organization of the Responsiveness Summary.

1.1 PERSPECTIVE ROADMAP FOR DECISION MAKING

This "roadmap" of the Agency's decision-making (1) shows how presumptive remedy approach works, (2) why Tulalip fits into that approach and why it is appropriate for Tulalip, (3) explains how all alternatives were examined using the nine criteria, including ARARs (how identified, how considered, how they apply and why selected remedy is protective), (4) why selected remedy makes technical (engineering) sense at Tulalip, and (5) briefly defines a streamlined baseline risk assessment and how it differs from a comprehensive baseline risk assessment.

EPA's use of the presumptive remedy approach at the Tulalip Landfill site is a reasonable approach to address the threats posed by the hazardous substances contained in the landfill and landfill leachate. Under the guidance document entitled "Presumptive Remedy for CERCLA Municipal Landfill Sites," OSWER Dir. No. 9355.0-49FS, September 1993 ("Presumptive Remedy Guidance") (EPA, 1993a), EPA explains why it believes that the presumptive remedy approach works formunicipal landfills and can be used by EPA as a tool to streamline the decision-making process at the RI/FS stage at municipal landfill sites. In the Presumptive Remedy Guidance, EPA states that containment is the presumptive remedy for municipal landfills. The containment presumptive remedy consists of various components, which may include a landfill cap, source area ground-water control, leachate collection and treatment, landfill gas collection and treatment, and/or institutional controls to supplement engineering controls. Id. at 2. EPA's Office of General Counsel has written a memorandum which explains the relationship between EPA's presumptive remedy initiative and the requirements contained in the National Contingency Plan ("NCP"), and has determined that the use of the presumptive remedy concept at CERCLA sites is consistent with the NCP requirements. See Memorandum from James E. Costello and George B. Wyeth entitled "Presumptive Remedies and NCP Compliance", dated June 14, 1995 (EPA, 1995a). However, in order to determine whether the Tulalip Landfill is a good "fit" for the use of a presumptive remedy, EPA Region 10 had to evaluate the site-specific conditions at Tulalip. A summary of this decision-making process is set out below.

First, Region 10 examined the reasons given in the Presumptive Remedy Guidance as to why the presumptive remedy approach works for municipal landfills and to see if that approach would work at Tulalip. The Guidance on page 2 states that:

> "Section 300.430(a)(iii)(B) of the NCP contains the expectation that engineering controls, such as containment, will be used for waste that poses a relatively low long-term threat or where treatment is impracticable. The preamble to the NCP identifies municipal landfills as a type of site where treatment of the waste may be impracticable because of the size and heterogeneity of the contents (55 Fed. Reg. 8704). Waste in CERCLA landfills usually is present in large volumes and is a heterogeneous mixture of municipal waste frequently co-disposed with industrial and/or hazardous waste. Because treatment usually is impracticable, EPA generally considers containment to be the appropriate response action, or the presumptive remedy, for the source areas of municipal landfill sites."

EPA Region 10 then examined the site characterization data, and concluded that the characteristics of the Tulalip Landfill were substantially similar to those at landfill sites where the use of the presumptive remedy has been deemed appropriate by EPA. See "Application of Presumptive Remedy at Tulalip Landfill" memorandum from E. McKenna, Assistant Regional Counsel, EPA Region 10, to the Tulalip Landfill File (August 4, 1995), (McKenna, 1995) located in the AR for the Tulalip Landfill Site. The Tulalip Landfill covers a large area of approximately 146 acres in Ebey Island on the Tulalip Indian Reservation. Between 1964 and 1979, approximately three to four million tons of mixed commercial and industrial waste was deposited in the landfill. Surveys show the waste is relatively evenly distributed at an average depth of 17 feet over the 147 acre landfill, with the depth of waste in the barge canals averaging approximately 30 feet. There were no records kept at the landfill regarding the exact location or exact types of wastes deposited in the landfill. Thus, it is impossible to determine specific "hot spot" areas of contamination associated with the landfill contents. Hazardous substances found in surface soils at the Site exceeded comparison numbers in one or more samples at eight of the nine leachate soil grid locations. At six of the leachate soil grid locations, subsurface soil samples were collected. Hazardous substances found in these subsurface soils exceeded comparison numbers in five of the six subsurface soil samples. Hazardous substances detected in leachate exhibited at least one exceedance of the Washington State Marine Chronic Criteria ("MCC") in

most of the eleven leachate seeps that were tested. Groundwater under the landfill is contaminated at levels exceeding Washington State Water Quality Standards ("WQS") (HLA, 1995; Weston, 1995b). Thus, it is clear that the Tulalip Landfill is a heterogenous source of hazardous substances at levels exceeding comparison numbers, and that these hazardous substances appear to be randomly distributed throughout the landfill. As such, Region 10 determined that the Tulalip Landfill was substantially similar to other landfills where EPA has applied the presumptive remedy concept, and that the Tulalip Landfill was indeed a good "fit" within the Presumptive Remedy Guidance guidelines.

The NCP remedy selection process involves several steps, including: (1) characterizing the risks presented by a site, (2) screening technologies for possible remediation, and (3) performing a detailed analysis of those technologies that appear most promising. The screening step is based on three criteria (effectiveness, implementability, and cost), and is designed to exclude those technologies which are clearly inferior. The identification of presumptive remedies serves, in effect, to carry out the screening step in a generic manner. Thus, the presumptive remedy for municipal landfills identifies containment as the presumptive remedy, and it provides components of the containment remedy (e.g, a cap, leachate collection) for EPA to then analyze on a site-specific basis using the nine NCP remedy selection criteria in order to develop remedial alternatives for the site. To that end, EPA Region 10 used the presumptive remedy of containment (and its components), along with alternatives suggested by other parties, to develop and analyze remedial alternatives at the Tulalip Landfill Site.

As part of this analysis of the Tulalip Landfill, Region 10 then determined that the source area of the Tulalip Landfill was an appropriate candidate for the use of a streamlined risk assessment. The preamble to the NCP states that risk assessments " ... are site-specific and therefore may vary in the extent to which qualitative analyses are utilized, depending upon the complexity and particular circumstances of the site, as well as the availability of pertinent ARARs and other criteria, advisories, or guidance." See 55 Fed. Req. at 8709.

EPA prepared a streamlined baseline risk assessment (Streamlined Risk Assessment) to facilitate evaluation of the need for potential early actions necessary to address contaminant migration from the Tulalip Landfill. Preparation of a streamlined risk assessment, as opposed to a comprehensive baseline risk assessment, is considered appropriate when addressing the potential risks associated with landfills because options for remedial action at landfill site source areas are traditionally limited to methods of containment. A streamlined risk assessment is a qualitative evaluation, based on comparison of site-related contaminant concentrations to available standards or risk-based chemical concentrations. The purpose of this type of evaluation is to assess the frequency and magnitude of exceedances of these comparison numbers and to use this information to assist in evaluating the need, or lack of need, for early action.

A comprehensive baseline risk assessment provides a quantitative evaluation of potential risk due to all chemicals in all media of concern considering site-specific exposure assumptions and a detailed evaluation of chemical concentrations. The Tulalip streamlined risk assessment is a qualitative evaluation of the frequency and magnitude of exceedance of comparison numbers considered to be protective of human health and the environment, based on standard exposure assumptions, and a qualitative evaluation of potential risks.

EPA has developed a fact sheet containing guidance for preparing streamlined risk assessments (OSWER Directive No. 9355.3-11FS, September, 1990) (EPA, 1990a). According to this guidance, a simple comparison of site-related chemical concentrations to available comparison numbers is sufficient to warrant remedial action. EPA went beyond this requirement in preparation of the streamlined risk assessment for the Tulalip Landfill by providing a critical evaluation of the relevance of available standards and by incorporating a comparison of site-related concentrations to regionally-available background concentrations. This was done to provide a more accurate evaluation of the need for early action.

EPA's Presumptive Remedy Guidance on page 5 states that:

> "[a]s a matter of policy, for the source area of municipal landfills, a quantitative risk assessment that considers all chemicals, their potential additive effects, etc., is not necessary to establish a basis for action if ground-water data are available to demonstrate that contaminants clearly exceed established standards or if other conditions exist that provide a clear justification for action."
>
> * * * *
>
> "Finally, a quantitative risk assessment is not required to determine clean-up levels because the type of cap will be determined by closure ARARs, and ground-water that is extracted as a component of the presumptive remedy will be required to meet discharge limits, or other standards for its disposal."

At the Tulalip Landfill, the Region decided that a streamlined risk assessment was appropriate because during the scoping process, EPA and the Respondents agreed that the best way to structure the RI/FS was to adopt the presumptive remedy approach for the source area of the landfill. Under EPA's Presumptive Remedy Guidance, EPA

can streamline the risk assessment process for solid waste landfills in cases where the presumptive remedy approach is appropriate. In the RI/FS workplan (which is part of the RI/FS AOC), the Tulalip Landfill was deemed appropriate for remedial action because concentrations of contamination at the landfill exceeded federal AWQC.

In contrast to all of the sites referenced by the commentor, the Tulalip Landfill is an appropriate candidate for the use of the presumptive remedy for municipal landfills. According to an EPA memorandum from James Costello and George Wyeth of EPA's Office of General Counsel entitled "Presumptive Remedies and NCP Compliance," June 14, 1995 (EPA, 1995a), "[t]he use of presumptive remedies follows the NCP remedy selection process because the identification of presumptive remedies serves, in effect, to carry out the screening and detailed analysis steps in a generic manner that minimizes the need to perform those steps at a site-specific level." Id. at 3.

Containment is the presumptive remedy which was found to be most commonly suited for municipal landfills because these landfills, as well the Tulalip Landfill **1**, share the following characteristics: (1) large volume and heterogeneity of waste which make treatment impracticable; (2) limited number of alternatives for controlling releases; (3) similar potential threats to human health and the environment resulting from leachate generation, soil contamination, landfill contents, landfill gases, and contamination of groundwater, surface water, sediments and adjacent wetlands; and (4) the nature of waste deposition. See generally "Presumptive Remedy for CERCLA Municipal Landfill Sites," OSWER Dir. No. 9355.0-49FS, September 1993 ("Presumptive Remedy Guidance"). Because the Tulalip Landfill shares these characteristics with municipal landfills and EPA is unaware of any technical reasons for not applying the municipal landfill presumptive remedy guidance, EPA has concluded that the presumptive remedy approach is appropriate for the Tulalip Landfill.

Pursuant to EPA's Presumptive Remedy Guidance, containment remedies usually include installing a low permeability cover to keep rain water from filtering down through the wastes in the landfill. Containment may also include some form of leachate collection and treatment, some form of landfill gas collection, or some form of groundwater control. The preferred remedial alternative as set forth in the Proposed Plan for the Tulalip Landfill is installation of a low permeability cover over the waste. This alternative would be expected to be effective in minimizing the migration of contaminated groundwater from the source area. Since the FS shows that the low permeability capwill minimize the generation of leachate by virtually eliminating the movement of contaminated groundwater to surface water, the Proposed Plan recommends taking no further action to remediate groundwater.

1 While EPA considers the Tulalip Landfill to be a solid waste landfill but not a municipal landfill, the Agency believes that using the municipal landfill presumptive remedy guidance at the Tulalip Landfill is appropriate.

The Presumptive Remedy Guidance recognizes that almost every municipal landfill site has some characteristics that may require additional study. For example, such characteristics may include leachate discharge to a wetland or significant water run-off caused by drainage problems, which will require more comprehensive characterization and a more comprehensive risk assessment to determine what, if any, additional remedial action is necessary. At the Tulalip Landfill, EPA is expected to complete a comprehensive baseline risk assessment in the summer of 1996. This comprehensive baseline risk assessment will examine the leachate discharges to the sensitive, ecologically valuable wetlands that surround the Landfill and to the sloughs adjacent to the Landfill. To that end, the FS for this site is being conducted in two parts: one for the containment alternatives, and one for the off-source alternatives. This analysis of the wetlands will not require a modification to this interim action because any impacts that may be occurring or have occurred to these wetlands can be addressed separate and apart from this interim action, and this interim action is needed to control the overall contaminant loading of the wetlands and sloughs that is presently occurring.

Under the source area FS, the Respondents' contractor, with Region 10 input,- developed and analyzed remedial alternatives, using the nine NCP remedy selection criteria. As part of this process, the FS identified potential applicable or relevant and appropriate requirements ("ARARs") from federal and state environmental laws. Section 121 of CERCLA requires that a remedial action attain all standards specified in the ARARs identified for a given site, or a justification must be provided in the ROD for waiving the requirement to attain the ARAR. In addition, compliance with ARARs is one of the two threshold NCP remedy selection criteria, the other being protectiveness of human health and the environment.

At the Tulalip Landfill site, Region 10 considered all federal, tribal and state ARARs when it examined the various remedial alternatives and chose Alternative 4c as the selected remedy. EPA's selection of alternative 4c as the preferred alternative is justified, as alternative 4c meets all ARARs identified for the Tulalip Landfill and is protective of human health and the environment. For example, EPA identified the state of Washington landfill closure requirements contained in the Minimal Functional Standards ("MFS") in WAC 173-304 as an ARAR for the source area of the landfill. The state's MFS for closure were determined to be

relevant and appropriate requirements because those MFS govern closure of municipal solid waste landfills and are more stringent than the federal solid waste landfill closure requirements codified at 40 C.F.R. § 258.60. Since Region 10 had decided that the Tulalip Landfill was substantially similar to a municipal solid waste landfill, the closure MFS contained in WAC 173- 304 were deemed to be relevant and appropriate for the Tulalip Landfill. These MFS for landfill closure are protective of human health and the environment as they are designed to prevent infiltration of precipitation into the landfill which thereby minimizes the generation of landfill leachate containing hazardous substances. Since minimization of landfill leachate at the Tulalip Landfill is one of the primary remedial action objectives in this interim action, the MFS for landfill closure are a necessary requirement which are met by the selected alternative, 4c. See Section 11.2 of the ROD for a more detailed discussion and analysis of the ARARs for this site.

In addition, the selected remedy also makes engineering and environmental sense. Of all of the alternatives considered by EPA, a geosynthetic cover with passive drainage is the least expensive containment alternative that will effectively stem the generation and flow of contaminated leachate into the surface waters surrounding the landfill. This containment remedy relies on a "passive" design that does not require pumps or outside power to control surface water drainage. A low permeability cover is implementable as a well-known technology, and is expected to be effective in the long-term, with established means to monitor and maintain the cover. The selected remedy will reliably achieve the remedial action objectives of reducing risks without the need for establishing elaborate contingency measures to plan for the possible failure of less certain measures. The cover will also allow for future use of the Site, with certain institutional controls required to protect the integrity of the cover. In addition, because the selected remedy is expected to virtually eliminate migration of leachate into the deeper Zone 2 aquifer, further remediation of Zone 2 groundwater will not be necessary after implementation of this selected interim remedy.

1.2 ORGANIZATION OF THE RESPONSIVENESS SUMMARY

EPA received a large number of comments from the AOC Respondents regarding the Proposed Plan for Interim Remedial Action at the Tulalip Landfill in Marysville, Washington. EPA has summarized all comments in detail and presented a response to each comment.**2** EPA has attempted to summarize the comments as accurately as possible. EPA decided to present all comments in detail to ensure the Agency's response is complete; consequently, the Responsiveness Summary is similar to the comments in its voluminous and detailed nature.

Comments were organized into categories for inclusion in the Responsiveness Summary. The categories are listed in the "Table of Contents" on page D-1 of this Responsiveness Summary. The organizational flow of the Summary by category begins with legal and regulatory policy comments, and then moves into a presentation of the more technical comments. Within each category, the Agency organized comments by various subtopics, or by addressing the more overarching comments for that category first and then proceeding to the more detailed comments for that category.

2 EPA has assigned each commentor a number. A bracketed number appears after each comment that identifies the commentor(s). The list of commentors and their identifying number is located in the "List of Commentors" on page D-2 of this Responsiveness Summary.

2.0 GENERAL LEGAL/POLICY ISSUES

2.1 Comment: "B.1. CERCLA and the NCP require the completion of a baseline risk assessment prior to the development and evaluation of remedial alternatives and the selection of any remedial action at the site." [1] [2] [3]

2.1.1 Additional Comments under Comment B.1.: The commentor also states that CERCLA "limits EPA's response action authority to circumstances where there is an imminent and substantial danger to public health, welfare, or the environment due to actual or threatened releases from a site." The commentor goes on to say that "any response measures undertaken by EPA, including the selection of appropriate remedial action, must be determined to be necessary, and also consistent with the National Contingency Plan ("NCP")." Finally, the commentor concludes that "unless site risks have been properly evaluated and established, EPA has no authority to take response action itself or to order others to respond to an actual or threatened release."

Response: The commentor is incorrect in stating that EPA may only respond in circumstances presenting an imminent and substantial danger. Section 104(a)(1) of CERCLA authorizes a response action whenever "(A) any hazardous substance is released or there is a substantial threat of such release into the environment, or (B) there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare[.]" (emphasis added) 42 U.S.C. 5 9604(a)(1). In this case, the release of many different hazardous substances into the environment has been documented in the RI/FS that is in the AR. For example, data in the RI/FS shows that there are 1367 exceedances of comparison numbers. Because there are documented releases of hazardous substances on the Site, EPA may undertake a response action at the Site regardless of whether those releases pose an imminent and

substantial danger to the public health or welfare. However, these releases of hazardous substances may present an imminent and substantial danger to human health and the environment. See Section 6.3 of the Tulalip Landfill Interim Action Record of Decision ("interim (action) ROD"), which states that "[c]omparison of the site measured chemical concentrations to the human health risk-based and ecological effects-based standards and criteria established under other environmental laws, and risk-based concentrations reveals potential risks to humans and the environment. Based on the RI/FS and findings in the risk assessment, EPA finds that actual or threatened releases of hazardous substances from the Site, if not addressed by the selected alternative or one of the other active measures considered, may present an imminent and substantial endangerment to public health, welfare, or the environment."

Section 121 of CERCLA, 42 U.S.C. § 9621, governs cleanup standards and selection of remedial actions. Section 121(a) states in part that:

> "The President shall select appropriate remedial actions determined to be necessary to be carried out under section 9604 of this title or secured under section 9606 of this title which are in accordance with this section and, to the extent practicable, the national contingency plan, and which provide for cost-effective response."

As is demonstrated in the AR, and as explained in this responsiveness summary, EPA has fully complied with its statutory requirements. The commentor mistakenly concludes that site risks must be "evaluated and established" through a baseline risk assessment before EPA can take a response action itself or order others to respond to an actual or threatened release. As discussed above, the only requirement for EPA to take a response action is if there is a release or threat of a release of a hazardous substance. And as will be explained below, EPA has fully complied with the requirements of the NCP by selecting a remedial alternative based on a completed streamlined baseline risk assessment prior to the completion of a comprehensive baseline risk assessment. See, also, Response to Comment 2.1.2, below.

2.1.2 Additional Comment under B.1.: The commentor also states that the "NCP requires EPA or potentially responsible parties, as part of the Remedial Investigation process and prior to any remedy selection, to conduct a baseline risk assessment that characterizes the nature and extent of threats to human health and the environment." [8] [17] [18]

Response: EPA has completed a streamlined baseline risk assessment, entitled the "Final Tulalip Landfill Risk Assessment for Interim Remedial Action," August 1995, (EPA, 1995d), (the "Streamlined Risk Assessment"), which is sufficient to support selection of an interim containment remedy at this Site. The NCP does not require a more comprehensive baseline risk assessment than the one EPA has completed in order to take the type of action that EPA is selecting for the Source Area of the Site. The NCP requires a balancing process to be employed in deciding whether early action is appropriate at a site. This balancing process involves weighing the need for prompt, early actions against the need for definitive site characterization. This balancing process is specifically linked to the RI/FS, including the risk assessment, at 40 C.F.R. § 300.430(a)(2):

> "Developing and conducting an RI/FS generally includes the following activities: project scoping, data collection, risk assessment, treatability studies, and analysis of alternatives. The scope and timing of these activities should be tailored to the nature and complexity of the problem and the response alternatives being considered." (Emphasis added).

The preamble to the 1990 revisions to the NCP states:

> "EPA expects to take early action at sites where appropriate, and to remediate sites in phases using operable units as early actions to eliminate, reduce or control the hazards posed by a site or to expedite the completion of total site cleanup. In deciding whether to initiate early actions, EPA must balance the desire to definitively characterize site risks and analyze alternative remedial approaches for addressing those threats in great detail with the desire to implement protective measures quickly. Consistent with today's management principles, EPA intends to perform this balancing with a bias for initiating response actions necessary or appropriate to eliminate, reduce, or control hazards posed by a site as early as possible" (Emphasis added). 55 Federal Register 8704 (March 8, 1990).

The Streamlined Risk Assessment reflects the nature and complexity of the problem and the response alternatives considered. EPA balanced the need for action based on its evaluation of existing data and the nature of the Site against the need to develop more data as the basis of a more comprehensive risk assessment. EPA has determined that the selected containment remedy is appropriate given the risks known to exist at the Site as evaluated in the Streamlined Risk Assessment.

The commentor asserts that the Streamlined Risk Assessment does not provide the level of detail to satisfy the fundamental purpose of a baseline risk assessment. The preamble to the NCP and guidance documents provide more detailed information on how EPA suggests risk assessments may be conducted at Superfund sites of varying

scope and complexity. A close examination of these sources shows that the Streamlined Risk Assessment is consistent with EPA's policy for sites of similar scope and complexity to the Tulalip Landfill Site and, does in fact, meet minimum requirements for risk assessment.

> "To implement an early action under the remedial authority, an operable unit for which an interim action is appropriate is identified. Data sufficient to support the interim action decision is extracted from the ongoing RI/FS that is underway for the site or final operable unit and an appropriate set of alternatives is evaluated...A completed baseline risk assessment generally will not be available or necessary to justify interim action.
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> * * *
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> "Qualitative risk information should be organized that demonstrates that the action is necessary to stabilize the site, prevent further degradation, or achieve significant risk reduction quickly. See 55 Federal Register 8704 (March 8, 1990) (Emphasis added).

The Streamlined Risk Assessment provides data "sufficient to support the interim action" decision. As quoted above, the supporting data may be extracted from the "ongoing RI/FS" and an "appropriate set of alternatives" may be evaluated prior to the issuance of a completed baseline risk assessment. The NCP clearly envisioned a situation such as this where information from the ongoing RI was used to complete a risk assessment which provides the basis for remedial action to stabilize that specific area of the Site. Consistent with the NCP, EPA plans to complete a comprehensive baseline risk assessment which will be used to evaluate whether additional cleanup actions will be needed for the off-source area, after a containment action for the source area has been selected.

EPA's "Risk Assessment Guidance For Superfund, Volume 1, Human Health Evaluation Manual (Part A)," December 1989 (EPA, 1989a), further elaborates on the principle that varying levels of detail are required in risk assessments, depending on the timing of the action to be taken at a Site:

> "Although risk information is fundamental to the RI/FS and to the remedial response program in general, Superfund site experience has led EPA to balance the need for information with the need to take action at sites quickly and to streamline the remedial process. Revisions proposed to the NCP in 1988 reflect EPA program management principles intended to promote the efficiency and effectiveness of the remedial response process. Chief among these principles is a bias for action." See page 1-1.
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> "Baseline risk assessments are site-specific and therefore may vary in both detail and the extent to which qualitative and quantitative analyses are used, depending on the complexity and particular circumstances of the site, as well as the availability of applicable or relevant and appropriate requirements (ARARs) and other criteria, advisories, and guidance." (Emphasis added). See page 1-6.

Similarly, in "Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual," March 1989 (EPA, 1989b), EPA advises at page 10 that "[t]he nature, extent, and level of detail of the ecological assessment will be determined according to the phases of the remedial process, the specific study objectives, and the characteristics of the site and its contaminants."

2.1.3 Additional Comment under B.1.: The commentor states that paragraph 35 of the AOC requires Region 10 to provide Respondents with "two or more baseline risk assessment memoranda prior to the Respondents' initiation of the Feasibility Study Report" and to issue a baseline risk assessment report during site characterization. The commentor goes on to state that the "Administrative Record for the Site, however, confirms that no baseline risk assessment memoranda were provided to Respondents prior to initiation of the Source Area Containment ("SAC") Feasibility Study report. Moreover, Region 10 has not yet issued a baseline risk assessment report."

Response: Section IX of the AOC, entitled "EPA's Baseline Risk Assessment," establishes that EPA will perform the baseline risk assessment, and provides some description of how EPA will provide information to the A0C Respondents for purposes of performing the feasibility study report. Paragraph 35 of the AOC states that EPA will provide sufficient information concerning baseline risks such that the Respondents can begin drafting the feasibility study report. EPA has prepared a streamlined baseline risk assessment for the source area of the Tulalip Landfill Site. In addition, a comprehensive baseline risk assessment for the entire site is expected to be completed in the summer of 1996. The commentor misconstrues Paragraph 35 as requiring a "baseline risk assessment" for the Source Area Containment Feasibility Study (SAC-FS). Moreover, the commentor narrowly interprets the AOC provisions for risk assessments used at this Site by failing to recognize the two-phased approach that was agreed upon by EPA and the AOC Respondents. In addition, the commentor is incorrect in stating that EPA is "required" to provide the memoranda identified in Paragraph 35.a. of the AOC before a feasibility study is completed.

Paragraph 35.a. of the AOC states that EPA will provide "sufficient information concerning the baseline risk

such that the Respondents can begin drafting the feasibility study report." There is no requirement that EPA prepare a baseline risk assessment "prior to" initiation of the feasibility study, as the commentor writes. EPA provided the AOC Respondents the draft Remedial Action Objectives for the SAC-FS based on data gathered at the site and reported by the Respondents during site characterization. The demonstrated exceedances of comparison numbers showed sufficient threats existed at the site to warrant development of source area containment alternatives. Information showing the threats at the site due to exceedances of established federal and state environmental criteria, standards, and risk-based concentrations provides an adequate basis to develop and evaluate remedial alternatives to address the environmental problems by attaining those existing requirements. Therefore, EPA believes that the site data submitted by the AOC Respondents showed the need for a response action to contain the landfill wastes, and the Remedial Action Objectives (RAOs) that EPA identified provided sufficient information for the AOC Respondents to prepare the SAC-FS.

The commentor's criticism of EPA for failing to complete the "baseline risk assessment" prior to completion of the SAC-FS fails to consider the phased approach that EPA and the AOC Respondents agreed to undertake at the Site. Paragraph 27 of the AOC and the RI/FS Work Plan attached to the AOC clearly specify that EPA and the Respondents agreed upon a two-phased approach for evaluating site conditions and possible response actions. Both EPA and the AOC Respondents recognized that the first phase was to evaluate alternatives for the presumptive remedy of containment.

In the first phase, the Respondents agreed to complete the Remedial Investigation for the entire site, and to submit a focused feasibility study for the landfill source area (referred to in Paragraph 27.g. as the "Source Area Containment Feasibility Study"). The second phase, described in Paragraph 27.h. of the AOC, involves preparation of a feasibility study called the "Site Feasibility Study" for the entire site, including areas surrounding the source area. The Site Feasibility Study required under the AOC clearly contemplates that it will be prepared after the Remedial Investigation Report had been completed and after EPA selects the source area containment remedy. Paragraph 27.h. states that the AOC Respondents shall prepare a Site Feasibility Study that "incorporates the Remedial Investigation by reference as approved by EPA, and considers the Source Area Containment Presumptive Remedy approved by EPA" (emphasis added). Therefore, the two-phase RI/FS approach to which the AOC Respondents and EPA agreed contemplates that the second phase, full Site Feasibility Study will incorporate the results of the first phase, which identified a source area containment remedy. Paragraph 27.h. of the AOC clarifies that both EPA and the Respondents recognized that EPA would choose a source area containment remedy prior to the initiation of the Site Feasibility Study. In other words, work under the AOC was designed so that EPA would prepare two risk assessments for the potential response actions at the Site: one for the source area containment remedy, and a second for the off-source area.

EPA prepared the Streamlined Risk Assessment to characterize current and potential threats to human health and the environment that may be posed by contaminants. The results from the Streamlined Risk Assessment indicate that action is appropriate to achieve significant risk reduction quickly. The comprehensive baseline risk assessment for the off-source area that EPA will prepare, and which is contemplated by Paragraph 35.b. of the AOC, will support the "Site Feasibility Study" required under Paragraph 27.h. of the AOC, which has not yet been initiated by the AOC Respondents. EPA has begun to prepare the comprehensive baseline risk assessment and will provide information from that effort when EPA directs the AOC Respondents to develop and submit the Site Feasibility Study pursuant to the terms of the AOC.

The commentor also is incorrect in asserting that Paragraph 35 of the AOC "requires" EPA to provide the memoranda that are described. Paragraph 35.a. of the AOC states that this information "will normally be provided in the form of two or more" memoranda, stating one memorandum will "generally" include certain information. The text of Paragraph 35.a. provides only guidance as to how EPA will prepare the risk assessment, and the terms of the AOC do not mandate either the number or content of the memoranda. In fact, EPA did provide the AOC Respondents an opportunity to comment on the Interim Remedy Risk Assessment, which contains all of the types of information described in Paragraph 35.a. EPA intends generally to follow the procedures described in Paragraph 35 as it prepares the comprehensive baseline risk assessment to support the Site Feasibility Study and selection of a final remedy for the site in addition to the source area containment remedy.

2.2 Comment: "B.2. Region 10's Screening-Level Risk Assessment for the Tulalip Landfill is Not the Baseline Risk Assessment Required by CERCLA, the NCP and the AOC." [2] [3]

Response: The Streamlined Risk Assessment developed for the Source Area of the Tulalip Landfill meets all statutory and regulatory requirements, as well as the requirements set out in the RI/FS AOC (See Response to Comment Section 2.1). Neither CERCLA, the NCP, nor the general risk assessment guidance dictate a single approach for conducting a risk assessment for all types of Superfund sites. The nature of the risk assessment is dependant on the scope and complexity of the site problem to be addressed.

The risk assessment for the on-source area of the Tulalip Landfill was initially referred to as a "screening level" risk assessment. However, that term has proven to be misleading. In general, a "screening level"

assessment is an evaluation of whether or not there are exceedences of "screening criteria" that have been selected for a particular site to determine if further study is warranted. A streamlined risk assessment under the presumptive remedy approach, on the other hand, compares site data to established human health and environmental criteria, standards, and risk-based concentrations in order to support EPA decision-making regarding the need for early or interim remedial action to protect human health and the environment at a given site. Thus, in order to avoid confusion in the future, the risk assessment that was prepared for the source area of the Tulalip Landfill is called the Streamlined Risk Assessment.

In selecting the interim remedy, EPA has correctly interpreted and followed the EPA Presumptive Remedy guidance. The guidance clearly provides for selection of an interim containment action based on the results of a streamlined baseline risk assessment. The "Final Tulalip Landfill Risk Assessment for Interim Remedial Action" (the "Streamlined Risk Assessment") meets the requirements of a streamlined baseline risk assessment prescribed in EPA's presumptive remedy guidance.

The EPA guidance document entitled "Streamlining the RI/FS for CERCLA Municipal Landfill Sites ("RI/FS Streamlining Guidance", OSWER Directive No. 9355.3-11FS, December 1990), explains the basic requirements for streamlining the baseline risk assessment which will support an early decision on a presumptive remedy. Page 3 states:

> "The purpose of the baseline risk assessment is to determine whether a site poses risks to human health and the environment that are significant enough to warrant remedial action. Because options for remedial action at municipal landfill sites are limited, it may be possible to streamline or limit the scope of the baseline risk assessment by:
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> 1. Using the conceptual site model and RI-generated data, to perform a qualitative risk assessment that identifies contaminants of concern in the affected media, their concentrations, and their hazardous properties which may pose a risk through the routes of exposure."

The Streamlined Risk Assessment performed at the Tulalip Landfill fully follows this guidance. Two conceptual site models have been prepared: one for Human Health Risks (Figure 5-5 of the interim ROD), and one for Ecological Risks (Figure 5-6 of the interim ROD). The Streamlined Risk Assessment is a qualitative risk assessment that identifies contaminants of concern in the affected media (summarized in Tables 5-1, 6-1, and 6-3 of the interim ROD). The interim ROD identifies contaminant concentrations in Tables 6-2, 6-4, and 6-5, and Figures 6-1 and 6-2. The streamlined Risk Assessment provides information on toxicity of chemicals that were found. Appendices A and B of the streamlined Risk Assessment provides information on how the standards and criteria were developed, against which the site data were compared, and why an exceedance of particular standards and criteria represents a potential threat to the ecosystem.

Page 3 of the RI/FS Streamlining Guidance states that:

> "2. Identifying all pathways that are an obvious threat to human health or the environment (see Figure 1) by comparing RI-derived contaminant concentration levels to standards that are potential chemical-specific ARARs for the action. These may include: (1) Non-zero MCLGs and MCLs for groundwater and leachate and (2) State air quality standards for landfill gases.
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> When potential ARARs do not exist for a specific contaminant, risk-based chemical concentrations should be used."

Potential chemical-specific ARARs, including standards and risk-based criteria, were used in the Risk Assessment. For the human health evaluation, they are listed in Table 6-1 of the interim ROD; those for the ecological evaluation are listed in Table 6-3. The potential chemical-specific ARARs, standards, and criteria were taken from a number of different sources, which are listed in the footnotes in the tables. Sample results from the Tulalip Landfill Site that exceeded these potential ARARs and criteria are summarized in Tables 6-2, 6-4, and 6-5 of the interim ROD. Tables 6-2, 6-4, and 6-5 show that Tulalip Landfill site-specific sample results indicate 1367 exceedances of potential chemical-specific ARARS, standards and risk-based criteria in various media.

Page 3 of the RI/FS Streamlining Guidance states that:

> "3. Where established standards for one or more contaminants in a given medium are clearly exceeded, the basis for taking remedial action is warranted (i.e., quantitative assessments that consider all chemicals, their potential additive effects, or additivity of multiple exposure pathways are not necessary to initiate remedial action)."

In accordance with this guidance, EPA concludes that an interim remedial action is warranted for the following media, for which more than one exceedance is documented In the interim ROD, Tables 6-2, 6-4 & 6-5:

Medium	Number of Exceedances **3**	Number of Contaminants
Leachate discharging from the perimeter landfill berm	510	41
Surface soil	414	26
Zone 2 ground water **4**	160	16 **5**
Subsurface soil	113	18
Surface sediment	94	8
Surface water	26	9
Leachate seep SP-01 **6**	26	9
Subsurface sediment	24	3

3 Includes exceedences of both total metals and filtered metals samples.

4 These results for Zone 2 ground water do not factor in dilution due to tidal mixing between ground water wells and the ground water/surface water interface.

5 Groundwater modeling results indicate that some of these contaminants are unlikely to meet Ambient Water Quality Criteria standards at the ground water/slough interface after taking into account potential dilution between the wells and the ground water/slough interface.

6 Leachate seep SP-01 is unique among the leachate seeps sampled during the RI because it is located on the landfill surface.

Based on this table, it is apparent that Site data exceed comparison numbers, which include potential ARARs, standards, criteria, and risk-based chemical concentrations, for at least 1 contaminant for all of the above media.**7** In fact, for most media there are a significant number of exceedences. Therefore, EPA has concluded that the basis for taking early, interim remedial action is satisfied. In accordance with the RI/FS Streamlining Guidance, the streamlined Risk Assessment is not required to provide "quantitative assessments that consider all chemicals, their potential additive effects, or additivity of multiple exposure pathways ... to initiate remedial action." See OSWER Dir. No. 9355-11FS, at p. 3. The RI/FS Streamlining Guidance expressly states that quantitative assessments are not necessary to justify remedial action where there is a clear exceedance of established standards.

As shown in the table above, the streamlined Risk Assessment clearly documents numerous instances where site-specific data exceed potential chemical-specific ARARs and standards, therefore EPA concludes that a more thorough risk assessment is not necessary prior to initiating an interim remedial action. The RI/FS Streamlining Guidance goes on to state:

> "This streamlined approach may facilitate early action on the most obvious landfill problems---groundwater and leachate, landfill gas, and the landfill contents---while analysis continues on other problems such as affected wetlands and stream sediments." Id.

7 There were also exceedences of Zone 1 ground water, but Zone 1 ground water was not included in the above list because exposure to Zone 1 ground water would most likely occur through exposure to either the leachate seeps or Zone 2 ground water entering the sloughs. The leachate seep and Zone 2 ground water pathways are already captured in the above list.

This is precisely the approach that EPA has taken at Tulalip Landfill. The RI/FS AOC and Work Plan have been structured to enable early action on the source area of the landfill, while analysis of other problems continues. EPA and the Respondents are currently proceeding on a separate track from this interim remedial action to continue evaluating alternatives for cleaning up the off-source wetlands and tidal channels in an off-source Feasibility Study, and to produce a comprehensive baseline risk assessment for the off-source areas of the landfill.

EPA has based its decision to proceed with an interim containment remedy based on numerous exceedances of risk-based criteria in various media associated with the landfill, including leachate, groundwater, pooled surface water on the landfill, and off-source sediments and soils. EPA has begun work on the site comprehensive baseline risk assessment, in accordance with the presumptive remedy guidance, which may be completed in the summer of 1996.

Presumptive remedy guidance makes no mention of the need to collect surface data, although it recommends the collection of many other types of data. A recent EPA guidance document, called "Presumptive Remedies: CERCLA Landfill Caps RI/FS Data Collection Guide" (EPA/540/F-95/009, August 1995), describes the types of data that should be gathered during the RI/FS. Although this guidance was not available during the scoping of the Tulalip RI/FS process, the RI/FS Work Plan is generally consistent with this guidance:

> "Since containment is the presumptive remedy for MSWLFs (Municipal Solid Waste Landfills), the Remedial Project Manager (RPM) can begin making arrangements to collect landfill cap design data as soon as a basis for remedial action is established.... " Id. at 1.

On page 5-1 of the RI/FS Work Plan for the Tulalip Landfill Site (April 1993), EPA established that a basis for remedial action existed based on site-specific data available at that time. Page 5-1 states;

> "The EPA has determined [Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites (EPA/S40/P-91/001), February 1991)] that remedial action for source control at the Tulalip Landfill is warranted because concentrations of several contaminants in surface water at the landfill (E&E 1988) exceed the established standards of ambient water quality criteria (see Section 3.1.2)."

EPA developed the RI/FS Work Plan, Field Sampling Plan, and Quality Assurance Project Plan in accordance with presumptive remedy guidance, and with considerable input from the Respondents prior to finalizing these documents. The Respondents, in signing the AOC, agreed to follow the presumptive remedy approach for the RI/FS, and agreed to collect site data in accordance with the Work Plans they helped create. In a January 11, 1993, letter,**8** one of the Respondents transmitted comments to EPA regarding the contents of a draft version of the RI/FS Work Plan:

> "Although we support the general concept of a presumptive remedy, in this case it is advisable to confirm environmental conditions on and in the vicinity of the landfill prior to remedy selection, and to base remedy selection on performance standards."

This statement indicates the Respondents supported the presumptive remedy approach for structuring the RI/FS, and that in their view, site data must be gathered and evaluated prior to selection of a remedy. Since the time that statement was written, the RI has been completed. Based on EPA's evaluation of the RI data, it is clear that environmental conditions on and in the vicinity of the landfill warrant remedial action.

The Respondents initiated a formal dispute process over additional work they wanted to perform after they had submitted the Source Area Containment Feasibility Study. EPA determined that the additional work the Respondents had requested was unnecessary and would not provide significant additional information for a decision on an interim containment remedy, and that the Respondents' request to perform this additional work was untimely. See, also, Response to Comment 2.9.1. EPA was not willing to delay site cleanup to allow for collection of this unnecessary data.

The Respondents' request to conduct additional sampling for the purpose of evaluating any chemical contamination on the landfill surface directly is addressed by EPA guidance on presumptive remedies. Page 5 of the "Presumptive Remedy for CERCLA Municipal Landfill Sites" states:

> "Streamlining the risk assessment of the source area eliminates the need for sampling and analysis to support the calculation of current or potential future risk associated with direct contact."

8 Letter dated January 11, 1993, from Leonard H. Sorrin of Bogle & Gates, and Jeffrey S. Myers of Short, Cressman & Burgess, to William Glasser, Remedial Project Manager, U.S. Environmental Protection Agency, Re: Comments of the Seattle Disposal Company on the Draft Work Plan for the Tulalip Landfill Superfund Site.

The EPA Region 10 Deputy Regional Administrator's determination on the Respondents' request to conduct such sampling was wholly consistent with this guidance.

The Respondents' request for additional work to install zone 2 wells near the Zone 2/slough interface contradicts their arguments during the Work Plan scoping process. In a draft version of the work Plan, EPA initially planned to install the Zone 2 wells near the Zone 2/slough interface. However, as part of written comments on a draft version of the Work Plan, the Respondents commented to EPA that the wells should be moved back to the landfill perimeter berm, a less expensive approach. In response, EPA agreed to allow installing the wells on the landfill berm. The final Work Plan stated that the wells would be installed on the berm, and during the RI/FS the Respondents installed the wells on the berm and began sampling them. They found exceedances of AWQC in the perimeter berm wells, and they employed a groundwater modeling approach to estimate what the concentrations would be at the groundwater/slough interface in order to evaluate whether State Ambient Water Quality Criteria (AWQC) standards were likely to be exceeded at the point where groundwater enters the slough.

The Respondents' modeling results indicated that, taking into account the dilution of contaminants that would be expected to occur between the perimeter wells and the Zone 2/slough interface, exceedances of AWQC were still likely at the Zone 2/slough interface for some contaminants. After the SAC RI and FS reports had been submitted, the Respondents initiated a formal dispute process under the AOC and argued that EPA should agree to the installation of additional wells at the Zone 2/slough interface, which they had argued against during scoping and prevailed. EPA believes that the approach used in the RI/FS at the urging of the Respondents, which included perimeter berm wells in conjunction with groundwater modeling, is a sound and reasonable technical basis for the purposes of EPA's decision regarding an interim containment remedial action.

2.3 Comment: "B.3. Region 10's Screening-Level Risk Assessment Is Insufficient and Untimely For Purposes of On-Source Remedy Determinations." [3]

2.3.1 Additional Comments under B.3.: The commentor also states that the "screening level risk assessment" is insufficient in that it failed to use site-specific data to satisfy the purposes of a baseline risk assessment. Additionally, the commentor states that the risk assessment produced by EPA for the Site is untimely in that it was issued after the SAC Feasibility Report process was completed.

Response: The comments regarding the sufficiency of the level of detail in the risk assessment and the appropriateness of the timing of the risk assessment are addressed above in the Response to Comment Section 2.1. In addition to the explanation provided in the Response to Comment Section 2.1 regarding the level of detail in the risk assessment, it is EPA's position that the Tulalip Landfill is an appropriate site for a streamlined risk assessment because sampling which had been conducted at the site during the RI indicated exceedances of water quality standards, criteria, and risk-based concentrations. See EPA OSWER Directive No. 9355.0-49FS, "Presumptive Remedy for CERCLA Municipal Landfill Sites," (EPA, 1993a), (Presumptive Remedy Guidance), which states that a site generally will be eligible for a streamlined risk assessment evaluation if groundwater contaminant concentrations clearly exceed chemical-specific standards or EPA's accepted level of risk, or other conditions exist that provide a clear justification for action. If no conditions are shown to exist that provide clear justification for action, a quantitative risk assessment that addresses all exposure pathways will be necessary to determine whether action is needed. See OSWER Dir. No. 9355.0-49FS, p. 5., (EPA, 1993a).

Streamlined risk evaluation is appropriate at the Tulalip Landfill because site investigation efforts, including sampling done from 1993-4 by the Respondents as part of the RI, indicate that landfill leachate leaving the Site exceeds comparison numbers that are considered protective of human health and the environment, including water quality standards and criteria, and risk-based concentrations for pesticides such as DDT and aldrin, polychlorinated biphenyls (PCBs), and heavy metals and other contaminants including chromium, copper, lead, mercury, nickel, zinc, ammonia, and heptachlor. The RI documents the presence of hazardous substances contaminating soils, sediments, surface water, and groundwater at the Site.

Hazardous substances found in surface soils at the Site exceeded comparison numbers in one or more samples at eight of the nine leachate soil grid locations. At six of the leachate soil grid locations, subsurface soil samples were collected. Hazardous substances found in these subsurface soils exceeded comparison numbers in five of the six subsurface soil samples. Hazardous substances found in leachate exceeded comparison numbers at least once in most of the eleven seeps that were tested. Chemicals detected in Zone 1 groundwater (which is generally located within the refuse layer of the landfill) exceeding MCCs included the metals copper, lead, nickel, and zinc, as well as ammonia, cyanide, and the pesticide heptachlor epoxide. The studies found that Zone 2 groundwater (which is generally located below the refuse layer, except for the former barge canals) was contaminated at levels exceeding MCCs for the metals copper, lead, and nickel, as well as cyanide and ammonia.

EPA's Presumptive Remedy Guidance recognizes that almost every municipal landfill site has some

characteristics that may require additional study. See OSWER Dir. No. 9355.0-49FS, p. 5. For example, such characteristics may include leachate discharge to a wetland or significant water run-off caused by drainage problems. These migration pathways, as well as groundwater contamination that has migrated away from the source, generally will require characterization and a more comprehensive risk assessment to determine whether action is warranted beyond the source area and, if so, the type of action that is appropriate. At the Tulalip Landfill, leachate from the landfill flows directly into sensitive, ecologically valuable wetlands that surround the Site, and into sloughs connected with the Snohomish River and Puget Sound. As a result, and consistent with EPA's Presumptive Remedy Guidance, the FS at the Site is being conducted in two phases in order to address first the containment alternatives, and secondly, the off-source alternatives.

2.3.2 Additional comments under Comment B.3.: The commentor concludes this comment section by reiterating that the Risk Assessment is inadequate. The commentor cites reasons for the apparent inadequacy, which are as follows: (1) the Risk Assessment relies on overly conservative criteria; (2) ignores extensive site data that demonstrates risks are negligible; (3) fails to consider background concentrations; (4) "screening level criteria" were not applied at appropriate locations/media; (5) use of 5 dated and nonrepresentative 1988 ponded water samples to characterize surface of a large surface; (6) denied respondents requests for additional sampling; and (7) the quality of data is questionable.

Response: To avoid extensive duplication, the reader is referred to the following specific responses. For: (1) the Risk Assessment relies on overly conservative criteria, see Responses to Comments 11.9 and 11.10; (2) ignores extensive site data that demonstrates risks are negligible, see Responses to Comments 2.10.2 and 11.6; (3) fails to consider background concentrations, see Responses to Comments 11.111 - 11.115; (4) "screening level criteria" were not applied at appropriate locations/media, see Responses to Comments 11.116 - 11.117; (5) use of 5 dated and nonrepresentative 1988 ponded water samples to characterize surface of a large surface, see Responses to Comments 2.9.2, 2.9.3 and 11.7; (6) denied Respondents requests additional sampling, see Responses to Comments 2.9, 2.9.1, and 2.10.3; and (7) the quality of data is questionable, see Responses to Comments 2.9.2 and 10.1 - 10.4.

2.4 Comment: "B.4. EPA's Failure to Complete a Baseline Risk Assessment For the Tulalip Landfill Is Inconsistent With Its Approach at Other CERCLA Sites" [3]

2.4.1 Additional Comments Under B.4.: The commentor identifies other landfills in Washington and in other states that the commentor believes are similar to the Tulalip Landfill. The commentor states that EPA properly utilized a baseline risk assessment process at those sites to determine the need for remedial action. The commentor concludes by saying that EPA acted inappropriately at Tulalip by failing to conduct a baseline risk assessment prior to selecting a remedy. The following sites were identified by the commentor: Whidbey Island Naval Air Station Operable Unit (OU)-2, Area 2/3 and OU-4, Area 48/49, the Hamilton Island Landfill, and the Everett Landfill (the previous three sites are located in Washington state), the Old City of York Landfill in Pennsylvania, the Suffolk City Landfill in Virginia, the Broward County Landfill in Florida and the Ordot Disposal Site in Guam.

Response: As explained in the Response to Comment 2.1, above, EPA is not required by statute, regulation, or guidance to complete a comprehensive baseline risk assessment prior to selecting and implementing an interim remedy. The presumptive remedy process permits EPA to conduct a streamlined baseline risk assessment for the source area at the Tulalip Site. This approach is also compliant with NCP and CERCLA requirements. In addition, EPA is preparing a comprehensive baseline risk assessment for the entire Tulalip Landfill site, which is expected to be completed in the summer of 1996. The comprehensive baseline risk assessment will evaluate the need for further action for the off-source areas of the site.

The Agency believes it is inappropriate and misleading to compare sites because the facts which form the basis for remedy decisions are unique to individual sites. It is impossible to draw the conclusion that because a certain approach was taken at one site, it is appropriate to take that approach at an unrelated site. The detailed decision-making process used at these other sites in choosing a response action may not be appropriate at the Tulalip Landfill. EPA Region 10 explains and supports in this interim ROD and the Response to Comments its decision-making process, including the use of a streamlined risk assessment, at the Tulalip Landfill.

It is useful to note a fundamental difference between the sites discussed by the commentor and the Tulalip Landfill: none of the sites identified by the commentor were evaluated or remediated (including No Action determinations) pursuant to the presumptive remedy process. At some sites the lead regulatory agency (in some cases a state agency) and the potentially responsible parties entered into contractual agreements for investigative work or started investigative work before the presumptive remedy approach was developed and consequently did not use the presumptive remedy approach to structure the RI/FS and the remedy selection process at those sites.

Sites which are located outside the state of Washington may not be "similar" to the Tulalip Landfill because they are subject to and must comply with different state ARARs. Landfill sites located on military bases may

have very unique characteristics with regard to the types of wastes disposed (e.g., munitions), and therefore are also not "similar" to the Tulalip Landfill.

While the commentor identifies certain of the operable units (OU-3 and OU-4) at the Whidbey Island Naval Air Station as examples, EPA notes that the commentor failed to mention the operable unit #1 at Whidbey Island. At OU #1, the final ROD called for a low permeability landfill cover which meets the requirements of the current state of Washington Minimal Functional Standards (MFS) for landfill closure.

2.5 Comment: "B.5. Region 10's Contention That a Screening-Level Risk Assessment Is Sufficient to Support an 'Interim Remedial Action' Costing In Excess of $40 Million Is Inconsistent With the NCP and EPA Guidance." [3] [8]

Response: The commentor's statement that the selected interim alternative costs $40 million is in error. EPA's estimated cost of the estimated interim remedy, Alternative 4c, Geosynthetic Cover with Passive Drainage, is $25.1 million **9**. This cost estimate includes construction costs and operation and maintenance (O&M) costs, calculated over a 30-year time period using a 5% discount rate. **10** EPA notes that O&M may be required for more than 30 years.

The commentor may be confused by statements EPA made to the AOC Respondents during the course of the de minimis settlement discussions that the total site costs were estimated at $40 million. The $40 million figure represents the $25.1 million cost of the interim remedy, plus EPA's past costs associated with the Tulalip Landfill site, plus costs incurred by the Respondents during the RI/FS, plus certain contingent costs.

Selection of a containment alternative such as Alternative 4c as an early/interim remedial action, is consistent with CERCLA, the NCP, and EPA guidance on presumptive remedies. Alternative 4c is considered an early remedial action because it may not be the only on-source or off-source action taken at the Site. Potential additional containment actions for the source area, if necessary, in the final ROD for the Site could include things such as a groundwater treatment system, installation of a perimeter leachate collection and treatment system, if post-cover construction monitoring shows that the cover is not adequately reducing discharges of hazardous substances from the Site.

9 The Respondents' cost estimate for this alternative, which does not account for the possibility that a landfill gas treatment system may be required, is $22.4 million.

10 EPA considers actual remedial costs to fall within +50% to -30% of the cost estimate. In general, more detailed cost estimates are developed after the ROD is issued, during detailed design stages.

2.5.1 Additional Comment Under B.5.: The commentor claims that Region 10 did not respond to technical comments on the draft risk assessment.

Response: EPA's August 4, 1995, letter to the Respondents, which transmitted the final streamlined risk assessment for the Interim Remedial Action, states, in part:

> "Please find enclosed the Final Risk Assessment for Interim Remedial Action...The draft was revised, in part to address those of your comments that EPA agrees are appropriately addressed in this document. EPA intends to provide written responses to your other comments (those with which we did not agree are appropriately addressed in this document) in the Responsiveness Summary that EPA will prepare at the conclusion of the public comment period for the Proposed Plan for Interim Remedial Action."

In accordance with the August 4th letter, this Responsiveness Summary addresses all of the Respondents' comments on the draft Streamlined Risk Assessment for interim remedial action. See, also, Response to Comments 11.6, 11.18 and 11.88.

2.5.2 Additional Comment Under B.5.: The commentor asserts that "the Presumptive Remedy Guidance limits use of a streamlined risk evaluation to those circumstances where a public health risk is manifest because chemical-specific groundwater standards are clearly exceeded."

Response: EPA has explained in Response to Comment Section 2.1, above, why the preparation of a comprehensive baseline risk assessment at this Site in support of this interim remedial action is neither necessary nor appropriate. Further, EPA's Presumptive Remedy Guidance identifies two situations where a comprehensive baseline risk evaluation is not necessary:

> "As a matter of policy, for the source area of municipal landfills, a quantitative risk assessment that considers all chemicals, their potential additive effects, etc., is not necessary to establish a

> basis for action if groundwater data are available to demonstrate that contaminants clearly exceed established standards or if other conditions exist that provide a clear justification for action." (emphasis in original) See EPA's "Presumptive Remedy for CERCLA Municipal Landfill Sites", OSWER Directive No. 9355.0-49FS, September 1993, p. 5, (EPA, 1993a).

The Tulalip Landfill site satisfies both of these situations. This guidance recommends only that exceedances of "groundwater standards" be demonstrated, or that "other conditions exist" which justify action, in order to implement a streamlined or qualitative risk assessment on the source area of a landfill rather than a quantitative, or comprehensive risk assessment. Contrary to the commentor's assertion, EPA's guidance does not limit the use of streamlined risk assessments to those situations where health-based drinking water standards are exceeded. The use of a streamlined risk assessment is, consistent with this guidance, particularly appropriate at the Tulalip Landfill because groundwater which has been shown to be contaminated at levels that exceed Washington State ambient water quality standards discharges directly from the landfill into surface waters. EPA disagrees with the commentor's narrow interpretation of the Presumptive Remedy Guidance that the term "standards" refers only to groundwater standards.

To further emphasize the appropriateness of using a streamlined risk assessment to implement an early remedial action, EPA notes that the Respondents have recognized that conditions at the Tulalip Landfill warranted an expedited approach for implementation of response action. The commentor, on behalf of his clients Josie Razore and John Banchero, sought an emergency preliminary injunction from the U.S. Court of Appeals for the Ninth Circuit, requesting that the Court take immediate measures to stop the generation of the leachate from the landfill. The PRPs cited expert testimony that leachate is discharging from the Tulalip Landfill at levels exceeding water quality criteria such that water quality in the surface waters adjacent to the landfill will "fall below the level that will sustain fish and other aquatic life in the waters surrounding the Landfill." See July 26, 1995, letter from Richard McAllister, Assistant Regional Counsel, EPA Region 10, to Wm. Roger Truitt of Piper & Marbury, (McAllister, 1995) (this letter can be found in the AR for the Tulalip Landfill Site).

EPA has proceeded with a streamlined risk evaluation to support selection of an early/interim remedy for the landfill source area consistent with EPA's Presumptive Remedy Guidance.

EPA is currently developing a comprehensive baseline risk assessment (comprehensive baseline risk assessment) for the Site. EPA expects the comprehensive baseline risk assessment will be completed in the summer of 1996. The purpose of the comprehensive baseline risk assessment will be to evaluate whether additional cleanup measures should be undertaken in the off-source areas to address contamination that has migrated to these areas from the landfill. A comprehensive baseline risk assessment is not necessary to develop interim alternatives for the source area of the landfill, nor would it allow development and evaluation of less expensive containment alternatives for the source area.

Selection of an interim remedial action for the source area is fully supported by the completed Streamlined Risk Assessment (RA) for Interim Remedial Action, which documents numerous exceedances of comparison numbers that are considered protective of human health and the environment. Based on the results of the RI/FS, the streamlined RA, the evaluation of the alternatives in the Proposed Plan against the nine criteria, and public comments, EPA has selected Alternative 4c as an interim remedial action because it provides the best balance of the nine criteria and is cost effective. Selection of this alternative as an early/interim action is fully consistent with CERCLA, the NCP, and EPA guidance. Completion of a comprehensive baseline risk assessment is not required to make this interim decision.

Contrary to the commentor's assertion, EPA's Presumptive Remedy Guidance for Municipal Landfills provides for EPA to take early and interim response actions, including conducting a streamlined risk assessment, in situations other than those in which chemical-specific groundwater standards have been clearly exceeded. The Presumptive Remedy guidance refers to previously-issued EPA guidances, in particular a February 1991 guidance (OSWER Dir. No. 9355.3-11) entitled "Conducting Remedial Investigations/ Feasibility Studies for CERCLA Municipal Landfill Sites", (EPA, 1991) which in turn references another EPA guidance document issued in September 1990, entitled "Streamlining the RI/FS for CERCLA Municipal Landfill Sites" (EPA, 1990a). The "Streamlining the RI/FS" guidance states as follows:

> "When established standards for one or more contaminants in a given medium are clearly exceeded, the basis for taking remedial action is warranted (i.e., quantitative risk assessments that consider all chemicals, their potential additive effects, or additivity of multiple pathways are not necessary to initiate remedial action.)" See "Streamlining the RI/FS for CERCLA Municipal Landfill Sites," OSWER Directive No. 9355.3-11FS, (September 1990), p. 3, (EPA, 1995a).

Clearly, this guidance envisions EPA performing streamlined risk assessments when standards in media other than groundwater are exceeded. In addition, it defies common sense to read the Presumptive Remedy Guidance as narrowly as the commentor suggests. CERCLA contains broad powers which allow the President (through the EPA) to address releases of hazardous substances that potentially or actually threaten human

health and the environment. The commentor's narrow reading of CERCLA and the Presumptive Remedy Guidance would tie EPA's hands and prevent EPA from acting quickly under CERCLA and the Presumptive Remedy Guidance to address releases to media other than groundwater. Clearly, in order to be able to protect human health and the environment, EPA must be able to address releases to all media, not just releases to groundwater, even if the action being taken was developed using the Presumptive Remedy Guidance.

2.5.3 Additional Comment Under B.5.: The commentor was concerned that "Region 10's analysis failed to consider another NCP program management principle, specifically: site specific data needs, the evaluation of alternatives, and the documentation of the selected remedy should reflect the scope and complexity of the site problems being addressed."

Response: On the contrary, EPA's approach at the Tulalip Site appropriately considered and implemented this NCP program management principle. As discussed above, the Tulalip Site has been broken into two phases: the first phase will address the source area of the landfill, and the second phase will address the off-source areas of the site. This phased approach was used in order to speed up the remedial process and tailor remedial decision-making to more specific areas of the site.

The June 14, 1995, memorandum from EPA's Office of General Counsel entitled "Presumptive Remedies and NCP Compliance" was issued in order to explain the relationship of EPA's presumptive remedies initiative for CERCLA sites to the requirements of the NCP, and specifically addresses consistency of the presumptive remedy approach with NCP program management principles such as site specific data needs and evaluation of alternatives. The OGC memorandum supports the presumptive remedy approach taken at the Tulalip Landfill site in selecting a remedy:

> "The use of presumptive remedies as part of the remedy selection process at appropriate sites is consistent with the program management principle in 40 C.F.R. § 300.430 (a) (1) (ii) (C). That is, using a remedy found to be generally appropriate for a class of sites narrows the scope and complexity of the remaining issues that need to be addressed on a site-specific basis. In other words, presumptive remedies speed up the remedy selection process so that, once site data has been gathered, EPA can begin action more quickly." Id. at p. 4.
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> "The identification of presumptive remedies serves, in effect, to carry out the screening and detailed analysis steps in a generic manner that minimizes the need to perform those steps at a site-specific level. In developing a presumptive remedy for a certain type of site, or sites containing a certain type of waste, EPA evaluates technologies that are commonly considered for a certain type of site and identifies one or more technologies as being generally most appropriate..."
>
> "Where circumstances at a site correspond to those for which the presumptive remedy was identified as generally suitable, the generic analysis of the NCP remedy selection criteria that was performed in identifying the presumptive remedy should be adequate, and need not be repeated site-specifically.... In effect, as will be discussed in more detail below, the materials prepared in the generic analysis will substitute for a broader FS. Similarly, the technology identification and screening steps done for the generic presumptive remedy analysis will serve as the technology and screening steps for the site at hand." Id. at P. 6.

EPA's intent in using presumptive remedies is to meet NCP requirements in a more efficient and streamlined manner. Presumptive remedies were designed as part of the Superfund Accelerated Cleanup Model (SACM), which turn is an EPA program management principle designed in response to PRP complaints that the remedy selection process was too lengthy and expensive, and that EPA mandated excessive study prior to the selection of alternatives. In designing presumptive remedies, EPA screened out, up-front, certain alternatives which would be inappropriate for particular types of sites. At the Tulalip Landfill Site, EPA followed the NCP requirements by using a presumptive remedy analysis as the technology and screening steps for the Site. In fact, EPA went beyond the requirements for presumptive remedies at this Site by evaluating alternatives, such as Alternatives 2b and 2b(ii), which do not fall within the traditionally accepted presumptive remedies for landfills. In addition, while 2b and 2b(ii) include the concept of leachate collection, the commentor has not identified sites where this design has been successfully employed in a similar environment as Tulalip.

2.5.4 Additional Comment under B.5.: The commentor also states that EPA in the NCP does not discuss when a screening-level risk assessment can be substituted for a baseline risk assessment.

Response: As discussed above in Response to Comment 2.1.2, the NCP recognizes that different sites require varying levels of analysis and study prior to the selection of a response action, depending on the approach selected for the site. Specifically, with respect to the scope of the risk assessment, the "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA, 1993a) states as follows:

"The municipal landfill manual states that a streamlined or limited baseline risk assessment will be sufficient to initiate response action on the most obvious problems at a municipal landfill (e.g. groundwater, leachate, landfill contents, and landfill gas). One method for establishing risk using a streamlined approach is to compare contaminant concentration levels (if available) to standards that are potential chemical-specific applicable or relevant and appropriate requirements (ARARs) for the action. The manual states that where established standards for one or more contaminants in a given medium are clearly exceeded, remedial action generally is warranted." See OSWER Dir. No. 9355.0-49FS, Sept. 1993, at p. 4, (EPA, 1993a).

This guidance also addresses the issue of whether a qualitative as opposed to quantitative risk assessment is necessary for an interim remedy at a municipal landfill:

"As a matter of policy, for the source area of municipal landfills, a quantitative risk assessment that considers all chemicals, their potential additive effects, etc., is not necessary to establish a basis for action if ground-water data are available to demonstrate that contaminants clearly exceed established standards or if other conditions exist that provide a clear justification for action." (Emphasis in original).

* * *

"Almost every municipal landfill site has some characteristic that may require additional study, such as leachate discharge to a wetland or significant surface water run-off caused by drainage problems. These migration pathways, as well as ground-water contamination that has migrated away from the source, generally will require characterization and a more comprehensive risk assessment to determine whether action is warranted beyond the source area and, if so, the type of action that is appropriate." (Emphasis added) Id. at p. 5.

EPA has followed this recommended approach in the Streamlined Risk Assessment. The primary conclusion of the Streamlined Risk Assessment is that actual concentrations detected in leachate being released from the landfill significantly exceed comparison numbers that are considered protective of human health and the environment, including specific health-based and ecological standards, criteria, and risk-based concentrations. The NCP's "bias for action" principle leads EPA to implement a response action that will expeditiously reduce this harm rather than wait for a full site-wide characterization of all problems caused by the landfill and an assessment (which are still under development in order to determine whether additional cleanup actions are necessary for the Tulalip Landfill site). Nothing in the NCP, the preamble to the NCP, or pertinent guidance requires EPA to wait until more studies are completed, or until a comprehensive, quantitative risk assessment is performed, to go forward with its plan for a containment remedy at the Tulalip Landfill site to reduce discharges of leachate. See, also, Response to Comment 2.2.

2.5.5 Additional Comment Under B.5.: The commentor states that Region 10's reliance on the Presumptive Remedy Guidance to streamline the risk assessment is "misplaced" because promulgated regulations such as the NCP "control" over unilaterally-issued Agency guidance when the regulation and the guidance "conflict", and because the use of a streamlined risk assessment is limited to only those sites where a public health risk is manifest and chemical-specific groundwater standards are clearly exceeded.

Response: The commentor claims that the NCP and EPA guidance documents conflict with each other in that the commentor states that the NCP always requires a site-specific baseline risk assessment to be completed before a remedial action is selected. EPA disagrees with the commentor's interpretation of the NCP requirements, and EPA disagrees with the commentor's belief that there is a conflict between the NCP and EPA guidance. As EPA observed in its Response to Comment Section 2.1, the NCP does not require a more comprehensive risk assessment than the one EPA has completed for the Tulalip source area in order to take the type of action that EPA is selecting for the source area of the Site. The NCP does require a balancing process regarding if and when EPA chooses to take early action at a site. This balancing process involves weighing the need for prompt, early actions against the need for definitive site characterization. The preamble to the 1990 revisions to the NCP states:

"EPA expects to take early action at sites where appropriate, and to remediate sites in phases using operable units as early actions to eliminate, reduce or control the hazards posed by a site or to expedite the completion of total site cleanup. In deciding whether to initiate early actions, EPA must balance the desire to definitively characterize site risks and analyze alternative remedial approaches for addressing those threats in great detail with the desire to implement protective measures quickly. Consistent with today's management principles, EPA intends to perform this balancing with a bias for initiating response actions necessary or appropriate to eliminate, reduce, or control hazards posed by a site as early as possible" (underlining added). 55 Fed. Req. at 8704 (March 8, 1990).

The Streamlined Risk Assessment that EPA has completed for the source area of the Site, along with the RI/FS

for the Site, reflect the nature and complexity of the problem and the response alternatives considered. EPA, in the Proposed Plan and this interim ROD, balanced the need for action based on its evaluation of existing data and the nature of the Site against the need to develop more data as the basis of a more comprehensive risk assessment. EPA determined that the selected containment remedy was appropriate given the risks known to exist at the Site as evaluated in the streamlined RA.

The preamble to the NCP and EPA guidance documents provide more detailed information on how EPA suggests risk assessments may be conducted at Superfund sites of varying scope and complexity. A close examination of these sources shows that the Streamlined Risk Assessment is consistent with EPA's policy for sites of similar scope and complexity to the Tulalip Landfill Site and, does in fact, meet minimum requirements for risk assessment:

> "To implement an early action under the remedial authority, an operable unit for which an interim action is appropriate is identified. Data sufficient to support the interim action decision is extracted from the ongoing RI/FS that is underway for the site or final operable unit and an appropriate set of alternatives is evaluated...A complete baseline risk assessment generally will not be available or necessary to justify interim action."
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> "Qualitative risk information should be organized that demonstrates that the action is necessary to stabilize the site, prevent further degradation, or achieve significant risk reduction quickly." See 55 Fed. Reg. at 8704 (March 8, 1990) (Emphasis added).

EPA's "Risk Assessment Guidance For Superfund, Volume 1, Human Health Evaluation Manual (Part A)," December 1989 (EPA, 1989a), further elaborates on the principle that varying levels of detail are required in risk assessments, depending on the timing of the action to be taken at a Site:

> "Although risk information is fundamental to the RI/FS and to the remedial response program in general, Superfund site experience has led EPA to balance the need for information with the need to take action at sites quickly and to streamline the remedial process. Revisions proposed to the NCP in 1988 reflect EPA program management principles intended to promote the efficiency and effectiveness of the remedial response process. Chief among these principles is a bias for action." See page 1-1.
>
> "Baseline risk assessments are site-specific and therefore may vary in both detail and the extent to which qualitative and quantitative analyses are used, depending on the complexity and particular circumstances of the site, as well as the availability of applicable or relevant and appropriate requirements (ARARs) and other criteria, advisories, and guidances." See page 1-6.
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> Similarly, in "Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual," March 1989 (EPA, 1989b), EPA advises at page 10 that: "The nature, extent, and level of detail of the ecological assessment will be determined according to the phases of the remedial process, the specific study objectives, and the characteristics of the site and its contaminants."

Thus, it is clear that Region 10's selection of the interim remedial action in the interim ROD is consistent with both the NCP and EPA-issued guidance, and that the NCP and the guidance documents do not conflict with each other.

Regarding the commentor's claims that the streamlined risk assessment is limited to only those sites where a public health risk is manifest and chemical-specific groundwater standards are clearly exceeded, EPA refers the commentor to the "Streamlining the RI/FS for CERCLA Municipal Landfill Sites" (EPA, 1990a) and the "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA, 1993a) guidance issued in September of 1990 and September of 1993. Both state that where "established standards for one or more contaminants in a given medium are clearly exceeded, the basis for taking remedial action is warranted." Neither guidance document stated that the "established standards" only refers to chemical-specific groundwater standards. Rather, the Presumptive Remedy Guidance uses an exceedance of groundwater standards as one example of when a presumptive remedy may be considered at municipal landfill sites. In addition, footnote #3 in the Presumptive Remedy Guidance states that if MCLs or non-zero MCLGs are exceeded, a response action generally is warranted. These are given as examples and should not be read as limitations on the triggering of a remedial action pursuant to the presumptive remedy process. Groundwater standards are frequently given as examples because groundwater for drinking water purposes is often one of the media of concern at a landfill. At the Tulalip Landfill, contaminated groundwater is unlikely to impact drinking water supplies, so EPA believes it would not be meaningful to compare Site groundwater data to MCLs or non-zero MCLGs, even though Site data does exceed these values for some chemicals. However, EPA does believe it is appropriate to compare Site data to state and federal surface water standards and criteria, because the Streamlined Risk Assessment and the RI show that contaminated groundwater from the Site discharges directly to surface waters at contaminant levels that exceed the surface water standards and criteria. The commentor did not submit a specific reference in his

comments supporting his claim that the use of presumptive remedies is limited to only those sites where there has been an exceedance of groundwater standards.

The commentor goes on to state that the July 26, 1995, letter from Richard McAllister of EPA to Wm. Roger Truitt (McAllister, 1995) confused exceedances of AWQC in the EPA ecological risk evaluation with the Presumptive Remedy Guidance's streamlining trigger for exceedances of health-based drinking water standards during EPA's ecological evaluation in the streamlined RA. Additionally, the commentor implies that because AWQC are not enforceable criteria, remedial action cannot therefore be based on exceedances of those criteria, and that remedial action can only be based on enforceable drinking water standards. As EPA has previously responded to the commentor, EPA in the Streamlined Risk Assessment used comparison numbers that are considered protective of human health and the environment, including specific health-based and ecological standards, criteria, and risk-based concentrations, when it examined Site data to determine whether there were human health and ecological risks at the Tulalip Site. Thus, any exceedances of the comparison numbers indicated to EPA that there may be a risk associated with those exceedances which required further discussion in the Streamlined Risk Assessment. See also Response to Comment 11.9.

Contrary to the commentor's claim, EPA did not confuse drinking water standards with AWQC in the development of the Streamlined Risk Assessment. EPA believes that it was consistent with CERCLA, the NCP and EPA guidance when it used federal AWQC and state AWQ standards as tools in development of comparison numbers in the Streamlined Risk Assessment.

With regard to the issue of whether federal AWQC can be used to justify remedial action, EPA has determined in the interim ROD that federal AWQC, along with the state of Washington water quality standards for surface water, are important chemical-specific relevant and appropriate ARARs. The AWQC are specifically identified as a potential ARAR in CERCLA Section 121(d)(2)(B), which states that federal water quality criteria are to be attained "where relevant and appropriate."**11** In addition, AWQ standards that are promulgated by the state of Washington and which are enforceable, have been identified as ARARs that are being exceeded under baseline conditions at the Tulalip Landfill. The interim remedy selected for implementation at the Tulalip Site must satisfy all ARARs identified in the interim ROD for the Site.

11 It should be noted that the commentor, in referring to Attachment 11 of his comments in support of his argument that federal ambient water quality criteria are not rules and have no regulatory impact," relies on a May 1, 1986, EPA guidance document. On October 17, 1986, Congress passed the SARA amendments to CERCLA, in particular Section 121 of CERCLA, which specifically states that federal water quality criteria may be "relevant and appropriate" standards in CERCLA actions. Thus, referencing the May 1, 1986, EPA guidance to support the idea that AWQC are not enforceable under CERCLA is not appropriate.

2.6 Comment: "B.6. Region 10's Screening-Level Risk Assessment is Contrary to Congressional Directives and "Common Sense" Superfund Administrative Reforms Announced by EPA Headquarters." [3]

Response: The commentor discusses some of the provisions in the U.S. Senate Committee on Appropriations "Committee Report." According to the commentor, the report states that EPA's cleanup budget will be reduced, that Congress will give direction to the Agency to focus its resources on the worse sites first and to modify its risk assessment procedures.

While it is true that EPA's budget, including the budget for the Superfund program, has been the subject of debate, the Agency does not yet have a final budget for this year. Nor has Congress produced any statutory revisions to CERCLA that have progressed to the point of approval in either the House or the Senate. Once a revised CERCLA bill becomes law, the Agency will review its requirements and make any appropriate changes in the Superfund program. At this time, the Agency cannot predict whether changes will need to be made in the way the Agency implements the Superfund program in the future and if those changes will have an effect on the evaluation and implementation of remedial action at the Tulalip Site. The Agency cannot base present decisions and action on draft Congressional bills such as HR 2099 which have not become law. Also, the Agency at present cannot make any predictions regarding the EPA budget directives or anticipate what the final budget will be, how monies will be allocated for what actions, or what the provisions of a re-authorized CERCLA will be. As such, EPA Region 10 will not make changes to the Tulalip Site decision-making process until EPA Headquarters has issued regulations or guidance on how a newly re-authorized CERCLA statute will be implemented and after the Region determines whether these changes would affect the Tulalip Site. For the present, the Region is lawfully and justifiably proceeding with this interim remedial action based on current laws, regulations, and policies. Further our planned action at the Tulalip Landfill is fully consistent with the Superfund Administrative Reforms initiative announced by the Agency an October 4, 1995.

2.6.1 Additional Comment Under B.6.: The commentor notes that the AR for this Site does not contain a health assessment conducted by the ATSDR. In addition, the commentor also notes that the Congressional Committee Report directs EPA to only take action when an ATSDR report indicates that a site poses a health

hazard.

The commentor also noted that EPA is implementing 20 new administrative reforms to the Superfund program. The commentor cites one of the reforms as being the establishment of national criteria to "reality test" risk assessments conducted by the Superfund program. The commentor goes on to conclude that the risk assessment "must be withdrawn and a proper baseline risk assessment using sound science, current land use and reasonable exposure pathways and assumptions must be performed for the Site."

Response: Region 10 will implement new reform policies when the criteria and procedures are in place to do so. The "national criteria" that the commentor refers to in his comment will be incorporated into the Tulalip Site if and when it is appropriate to do so. This current action at the Tulalip Landfill is fully consistent with EPA policy.

ATSDR completed a preliminary health assessment for the Tulalip Landfill Site on June 2, 1993. That ATSDR report did not identify that a health emergency existed at the Tulalip Site. However, the ATSDR report was based upon sampling data and Site information as it existed at the time it was prepared. Since that time, the RI conducted by the Respondents has shown numerous exceedances of comparison numbers used in the Streamlined Risk Assessment. These comparison numbers are considered to be protective of human health and the environment. The Region considered but did not rely upon the information contained in the 1993 ATSDR report when the Region made its interim remedial action decision in the interim ROD for the Tulalip Landfill Site. However, the Region has added the 1993 ATSDR report to the AR for this Site as historical information.

As mentioned above, EPA is unwilling to speculate how any new CERCLA legislation or EPA funding legislation will look in their final form. The Region cannot implement the CERCLA program based upon draft legislation. The Region must continue to implement the CERCLA law as it is currently written, and as directed by EPA guidance and policy. Therefore, the Region disagrees with the commentor's statements that the streamlined risk assessment for the Tulalip Site "must be withdrawn" and that a comprehensive "baseline risk assessment" must be performed before the Region can proceed with this interim remedial action. A comprehensive baseline risk assessment is currently being developed for the Tulalip Landfill Site. EPA expects the comprehensive baseline risk assessment may be completed in the summer of 1996. The purpose of the comprehensive baseline risk assessment is to evaluate whether additional cleanup measures should be undertaken in the off-source areas to address contamination that has migrated to these areas from the landfill. A comprehensive baseline risk assessment is not necessary to develop interim alternatives for the source area of the landfill, nor would it allow development and evaluation of less expensive containment alternatives for the source area.

2.7 Comment: "C. Region 10 Has Developed the Proposed Plan in an Arbitrary, Capricious and Unlawful Manner."**12** [3]

2.7.1 Additional Comment under C.: The commentor suggests that the Region failed to act impartially when it selected a cap as part of this interim remedial action. The commentor suggests that the Region had "pre-ordained" that a cap would be the preferred alternative in the Region's development of the Proposed Plan for this interim action.

> **12** The commentor listed his comments on page 15 of his October 25, 1995, letter as being under subheading "B", while on page 3 of his letter, he also lists those comments as being under subheading "B". The Region will treat the comments from page 15 to page 29 as being under subheading "C," in order to avoid confusion.

Response: Contrary to the commentor's assertions, the Region did not "pre-ordain" that a landfill cap would be the preferred alternative for containment of the hazardous substances at the Tulalip Landfill. The commentor cites a letter dated May 7, 1993, written by the Region 10 Project Manager and sent to the Tulalip Tribes of Washington, in which the commentor suggests that the Region had "pre-ordained" that a cap would be the preferred alternative. In that letter, Region 10's Project Manager states:

> "EPA, in consultation with the [Tulalip] Tribe and the Bureau of Indian Affairs, has determined that the "presumptive remedy" of containment is appropriate for the Site. A "presumptive remedy" means that we expect the final remedy will in some manner contain the landfill wastes through a cap and other appropriate controls. In other words, the RI/FS will not evaluate more expensive remedial alternatives, such as to excavate, treat or otherwise dispose of the waste materials." (Emphasis added).

* * * *

> "The goal of the containment action will be to attain quickly a cleanup that is protective of human health and the environment. A key component of the containment remedy will be a cap that covers the waste material that is buried at the landfill. The purpose of a cap will be to minimize leachate production by preventing precipitation and surface water from coming in direct contact with the landfill wastes."

The commentor misconstrues the statements made in that letter. Contrary to the commentor's assertions, EPA did not pre-select a landfill cover for Tulalip Landfill prior to issuance of the interim ROD. EPA's presumptive remedy guidance calls for "containment" as the presumptive remedy. The guidance does not dictate that the presumptive containment remedy shall, in every case, consist of a landfill cover. However, the guidance clearly recognizes that in the past, for most municipal landfill-type sites, a low permeability landfill cover was the selected remedy. In addition, page 2 the guidance document "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA, 1993a) states:

> "Highlight 1 identifies the components of the presumptive remedy. Response actions selected for individual sites will include only those components that are necessary, based on site-specific conditions."

> Highlight 1: Components of the Presumptive Remedy:
> Source Containment
>
> - Landfill cap
> - Source Area ground-water control to contain plume
> - Leachate collection and treatment
> - Landfill gas collection and treatment
> - Institutional controls to supplement engineering controls

Highlight 1 is reproduced verbatim from the guidance document. Presumptive remedy guidance clearly envisions a low permeability landfill cap as a component of containment, and states that the RI/FS should be streamlined to gather data necessary to support construction of the presumptive remedy. Page 6 of this guidance document states: "[t]herefore, the focus of the RI/FS can be shifted....to collecting data to support design of the containment remedy." The guidance also states that once EPA determines action is necessary, State landfill closure requirements [i.e., the Washington State Minimum Functional Standards codified at Chapter 173-304 of the Washington Administrative Code (WAC)] which are ARARs and are more stringent than federal standards must be either attained or waived. EPA has determined that there is a need for an interim remedial action at Tulalip, and that the Chapter 173-304 standards have been identified as an ARAR in the interim remedial action ROD, and those standards call for the installation of a low permeability cap on the landfill surface. See WAC 173-304-460(3).

Another guidance document, entitled "Streamlining the RI/FS for CERCLA Municipal Landfill Sites" (EPA, 1990a), states on page 4:

> "The most practicable remedial alternative for landfills is generally containment. Figure 3 is a simplified decision tree for identifying the appropriate type of cap." (Emphasis added).

This statement, and other statements throughout the guidance documents on presumptive remedies and municipal landfills, indicates that a streamlined RI/FS, which is what was used at the Tulalip Site, suggests a data collection approach that will provide for early implementation of a containment remedy, which generally will include a landfill cap.

EPA guidance calls for containment of landfill wastes, not necessarily a landfill cap, as the presumptive remedy for municipal landfills. The presumptive remedy guidance does call out capping as an alternative that should be considered as a containment alternative, along with leachate, groundwater, and landfill gas controls. Accordingly, the interim ROD evaluates containment alternatives that do and do not include a low permeability landfill cap. The following alternatives from the ROD do not include a cap:

1	No Action
2	Active Seep Interception
2b	Leachate Collection with Discharge to Treatment Berm
2b(ii)	Leachate Collection with Discharge to POTW
3	Leachate Seep and Groundwater Collection and Treatment

The following alternatives do include a cap:

4a	Soil Cover with Passive Drainage
4b	Geosynthetic Cover with Active Drainage
4c	Geosynthetic Cover with Passive Drainage
4d	Composite Cover with Passive Drainage
5	Cover with Leachate Seep Control
6	Cover with Leachate Seep Control and Zone 2 Groundwater Collection/Treatment

EPA devoted a substantial amount of resources, and significantly delayed issuing the Proposed Plan for Interim Remedial Action, to fully evaluate the Respondents' proposed Alternative 2b. EPA received a written proposal from the Respondents regarding Alternative 2b on June 30, 1995, after the final Source Area Containment Feasibility Study had been submitted to EPA on May 5, 1995. Subsequent to the April meeting with the Port of Seattle, EPA met with the Respondents and the Tulalip Tribes and internally several times to discuss and evaluate Alternative 2b. In order to fully evaluate the technical issues associated with Alternative 2b, EPA delayed issuing the Proposed Plan by at least a month. EPA's written technical evaluation of Alternative 2b is in the form of a Memorandum to The File by Eric Winiecki, dated August 4, 1995, (Winiecki, 1995d) which has been included in the Administrative Record for this interim remedial action. The memorandum includes technical analyses and a revised cost estimate from EPA's technical consultant, Roy F. Weston, Inc. Attached to the memorandum are additional, written technical memoranda from EPA technical staff based on their review of Alternative 2b, including Catherine Massimino (engineer), Glenn Bruck (hydrogeologist), Rene Fuentes (hydrogeologist), Jay Vasconcelos (microbiologist), and Donald Matheny (chemist).

The Respondents collected and analyzed data during the RI/FS in accordance with the RI/FS Work Plan and the RI/FS Field Sampling Plan, and the Quality Assurance Project Plan (QAPP) which were attachments to the RI/FS Administrative Order on Consent. The Respondents actively participated in negotiating the contents of these Plans over a 9-month "scoping" period, and EPA made many changes to the draft Plans based on comments from the Respondents.**13** In accordance with EPA guidance on presumptive remedy guidance, including "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA, 1993a), the Plans were developed using a streamlined approach to gather data to support early implementation of a containment remedy at Tulalip Landfill. The data collection described in these Plans is consistent with EPA guidance on gathering data for landfill sites and presumptive remedies, including "Conducting Remedial Investigation/ Feasibility Studies for CERCLA Municipal Landfill Sites" (EPA, 1991). By signing the AOC, the Respondents agreed to do the work described in these Plans which they helped prepare.

The Respondents agreed with this streamlined presumptive remedy approach for the RI/FS at the time they signed the AOC. Section IV of the AOC, entitled "Statement of Purpose," **14** states:

> "The goal of EPA, Respondents, and the Tulalip Tribe is for construction of the presumptive remedy for this site to begin during the Summer of 1995. Preparation of the design documents and specifications for the response action to implement the presumptive remedy, which will be governed by a separate agreement or an amendment to this Consent Order, may begin prior to completion of the feasibility study of the Source Area Containment. In order to achieve this goal, Respondents, EPA and the Tulalip Tribe recognize that agreement may be required on the conceptual design of one or more of the containment component(s) of the presumptive remedy before the final feasibility study of the Source Area Containment is approved by EPA under this Consent Order."

When they signed the AOC, the Respondents agreed upon a data collection approach that they had extensive participation in developing, and that was consistent with EPA's guidance on presumptive remedies. In fact, the Work Plan for the RI/FS, which was incorporated into the AOC signed by the Respondents, on page 4-1 states that:

> "Containment technologies that are applicable to the Tulalip Landfill include capping and control of landfill gas, leachate, and groundwater. A relatively extensive geotechnical investigation has been designed for the RI. Results are expected to facilitate evaluation of detailed containment alternatives and thereby accelerate remedial design and implementation. Additional RI tasks to determine the nature and extent of contamination and the associated risks to human health and the environment are unnecessary for the Tulalip Landfill proper since a presumptive remedy for source control has been selected."

13 In response to EPA's offer to participate in the RI/FS scoping process, some of the Respondents opted to participate, and some declined.

14 Page 3, Paragraph 7. of the AOC.

Thus, the Respondents had agreed to the streamlined presumptive remedy approach when they signed the AOC which specifically identified capping as an "applicable containment technology for the Tulalip Landfill."

2.7.2 Additional Comment Under C.: The commentor asserts that EPA improperly considered the Tulalip Tribes' future land use plans when selecting Alternative 4c.

Response: EPA disagrees with the commentor's assertions that the Region improperly considered the Tulalip Tribes' future land use plans when selecting the interim remedial action in this ROD. See, also, EPA's Response to Comment 11.27. In fact, obtaining Tribal acceptance of the selected interim remedy is, in the case of the Tulalip Landfill Site, one of the nine NCP remedy selection criteria (state acceptance is a modifying criteria) EPA must consider when evaluating remedial alternatives. See Section 104 of CERCLA, 42 U.S.C. § 9604, and 40 C.F.R. §§ 300.430(e)(9)(iii) and 300.515. Moreover, the AOC which was negotiated with the Respondents and the Tulalip Tribes specifically provides for the Tribe to submit its plans for future land use at the Landfill. The purpose of the submittal was to inform EPA and the PRPs so that the Tribes' plan could be considered in the development of alternatives.

On October 19, 1995, the Tulalip Tribes submitted comments during the public comment period for the Proposed Plan that express support for the preferred alternative in the Proposed Plan, and provided reasons for their support. This comment letter is included in the AR for this Site. In general, the Tribes' letter expresses concerns about risks posed by the Site, and describes their views on the effectiveness of the various interim remedial alternatives presented in the Proposed Plan.

Because Tribal acceptance is, in the case of Tulalip Landfill, one of the nine criteria in the NCP against which EPA must evaluate alternatives, EPA is required to consider Tribal support (or lack thereof) when selecting an interim remedy for the site. EPA has considered Tribal support of Alternative 4c in accordance with the requirements of CERCLA and the NCP. However, the commentor seems unclear about the respective roles of EPA and the Tribes with respect to remedy selection. in accordance with CERCLA Section 104 and Executive Order 12580, selection of the interim remedy is solely EPA's decision, not the Tribes'.

Historically, EPA has been criticized for selecting remedies that have, in effect, "placed a fence around the site" and prohibited any future productive use of the site. Accordingly, relatively recent EPA guidance indicates that EPA should consider future land use during the remedy decision process. See "Land Use in the CERCLA Remedy Selection Process", OSWER Dir. No. 9355.7-04 (May 25, 1995), (EPA, 1995c).

EPA notes that it is unlikely that a landfill cover would be selected solely on the basis of a landowner's desire to develop the land. While a landfill cover would allow some limited use or development on the landfill surface, a landfill surface is not an ideal surface for future development and significant restrictions are often necessary to prevent damage to the cover system. Accordingly, the selected remedy includes institutional controls to prevent damage to the cover system. When design and construction of the interim remedy are complete, EPA and the Tulalip Tribes shall develop a document entitled "Routine Use of Tulalip ('Big Flats') Landfill" (Tulalip Tribes, 1994), to ensure the continued integrity of the cover system. Any future commercial or development activity on the landfill surface will require advance, written agreement between EPA and the Tribes to ensure the continued integrity of the cover system. See Section 10.1 of the ROD for further details.

2.8 Comment: "C.1. The Proposed Plan's Focus On Reducing Leachate Discharges Is Inconsistent With Region 10's Failure to Enforce the Clean Water Act at the Site Since 1986." [3]

2.8.1 Additional Comments Under C.l.: The commentor believes that the Region acted in an arbitrary and capricious manner by failing to enforce the Tribe's NPDES permit which prohibits discharges of pollutants into navigable waters unless authorized by a permit issued pursuant to Section 402 of the Clean Water Act (CWA), and instead selecting a remedy in the Proposed Plan which has as a primary objective reduction of leachate from the landfill. [8] [18]

Response: The Region disagrees with the commentor's assertions that the Region acted inconsistently under the CWA and CERCLA with respect to enforcement of the Tribes' NPDES permit versus proceeding with remedial action under CERCLA.

EPA's obligation to take enforcement actions for violations of NPDES permits is wholly discretionary. EPA is not required by the statute to take enforcement action against a person who is in violation of a permit because effluent standards or limitations are being exceeded according to the terms of the permit. EPA has been given the discretion to decide whether to use the enforcement powers under the CWA against violators of NPDES permit conditions. The Agency was given this discretion in order to be able to use all of its "tools", such as remedial action under CERCLA, in deciding what is the best way to respond to releases of hazardous substances from a site. In some cases, enforcement of existing permit conditions may be the best way to effectuate a timely and adequate response to such a release of hazardous substances. In other cases, pursuit of an enforcement case under the CWA may result in needless delays due to litigation, which would have the

untenable result of allowing the discharges of hazardous substances to continue pending the outcome of such litigation.

In the case of the Tulalip Landfill, EPA Region 10 decided that the use of its CERCLA remedial action tools, rather than its enforcement tools under the CWA, to address the releases of hazardous substances was the best use of limited Agency resources and was the most timely and cost-effective method available to the Agency at the time that decision was made. By using CERCLA, EPA is addressing the source of the discharge and preventing future generation of leachate.

In addition, Section 5O5 of the CWA permits any citizen to commence a civil action against any person allegedly in violation of an effluent standard or limitation or an order issued by EPA regarding such a standard or limitation. This citizen suit provision is meant to provide a measure of policing of NPDES permit compliance in the absence of the use of EPA's discretionary enforcement authority for NPDES permit noncompliance.

This commentor, in fact, utilized the citizen suit provision of the CWA by bringing suit on behalf of his clients, who are Respondents to the RI/FS AOC, against the Tulalip Tribes of Washington and Federal defendants. The claims were based on violations of the Tribes' NPDES permit. The Court dismissed the commentor's clients' claims based on the jurisdictional bar of Section 113(h) of CERCLA.

The commentor, in his clients' citizen suit action, asked the Court to enjoin further unpermitted discharges of pollutants from the landfill and to require compliance with the terms of the Tulalip Tribes' NPDES permit. The commentor further asked the Court to order EPA to enforce the CWA against the Tulalip Tribes and BIA, including enforcing the terms of the expired NPDES permit. As the United States argued in its brief for the United States of Appeals in Josie Razore and John Banchero v. The Tulalip Tribes of Washington, No. 94-35985 (9th Cir), at page 26, "There is no way to stop discharges from the landfill, or to bring the site into compliance with the terms of the expired NPDES permit, without undertaking some sort of response action."

EPA, relying on its technical expertise and enforcement discretion, chose not to address the leachate problem through enforcement of the CWA, but rather, chose to address the environmental problems at the Site by developing an appropriate response action under CERCLA. CERCLA was specifically established to provide a comprehensive statutory scheme to address and accomplish the cleanup of actual or threatened releases of hazardous substances. It was under CERCLA that EPA believed the most comprehensive and technically viable response could be developed to address the leachate problem as well as the other environmental problems at the Site. EPA maintains that this is the most rational and responsible approach given the Agency's various legal authorities, and is confident that the alternative it has selected in the ROD to address Source Area contaminants is the most viable after taking into consideration all required factors.

The commentor also refers to a Region 9 Superfund Site in support of his contention that the Region 9 Site is "remarkably similar" to the Tulalip Landfill. Since the Region 9 Site ROD specified "no-action," the commentor suggests that Region 10 is being inconsistent in requiring "action" to be taken at the Tulalip Landfill. Region 10 disagrees with the commentor's description of the Region 9 Site being "remarkably similar" to the Tulalip Landfill. The Region 9 Site is the Ordot Landfill in Guam. That Site is an operating municipal landfill. Tulalip is not an operating landfill. The Ordot Site "no action ROD" stated that CERCLA action was "inappropriate at this time" (emphasis added) "based on several facts," which were as follows:

> "1) the Ordot Landfill is an operating municipal landfill;
> 2) all but approximately 4 to 7 acres of the 47 acre site are active waste disposal areas;
> 3) the 4 to 7 inactive acres are down-gradient of the active waste disposal areas or are immediately adjacent to active waste disposal areas;
> 4) any remedy for the inactive areas will likely be affected by activities at the active waste disposal areas or continued surface flows through the landfill;
> 5) the bulk of any environmental impacts from the landfill will result from activities at the active waste disposal area;
> 6) the landfill, by applying standard operation practices to control landfill leachate, can effectively reduce or eliminate the surface flow of leachate to receiving waters;
> 7) EPA has issued an order under the Clean Water Act that requires the Guam Department of Public Works to cease discharge of leachate from the landfill to the nearby river; and
> 8) EPA data, although too limited for comprehensive conclusions, has not demonstrated any imminent and substantial endangerment to human health or welfare or the environment."
>
> "EPA concludes that threats to human health and the environment currently identified at the landfill are due to poor operation practices and can best be mitigated through addressing operations and maintenance of the landfill itself including improved leachate control measures consisting of capping and surface water control. EPA concludes that the appropriate mechanism for implementing these controls is through enforcement of the Clean Water Act. The responsibility for implementing these controls lies with the landfill operator, the territory of Guam. Expenditures from the Superfund for

these purposes are not appropriate. Further, EPA concludes that any remedial action to address the inactive portion of the landfill potentially appropriate for response under CERCLA would be jeopardized or nullified unless operation practices at the active disposal areas are improved to reduce leachate formation and prevent discharge of leachate. The design for improved operations at the active disposal areas must consider the inactive portion due to the nature of the site and thus would make a separate CERCLA remedial action unnecessary." (Emphasis added) (Winiecki, 1995a, Attachment M, at p.1 & 2).

The differences between the Tulalip Landfill and the Ordot Landfill are great. The Ordot Landfill is primarily an operating municipal landfill with the primary concern being leachate coming from the active waste disposal areas through a surface water pathway. EPA Region 9 found that "the surface flow through the landfill is the source of the leachate, the site is hydrologically isolated from the island's sole-source aquifer, there is an absence of organic contaminants, inorganic contamination is below the appropriate MCLs, and no air quality problems exist" (Winiecki, 1995a, Attachment M, at p. 2). In contrast, at Tulalip, the landfill ceased operations in 1979, and the leachate is being generated as a result of infiltration of precipitation and is discharging to both surface waters and groundwater. In addition, a cap was identified as one of the necessary components of the remedy under the Clean Water Act at the Ordot Landfill.

Further, unlike the Ordot Landfill, the Tulalip Landfill is hydrologically connected to both the groundwater and the surface waters and is adjacent to sensitive wetlands. There are numerous exceedances of comparison numbers that are considered to be protective of human health and the environment at the Site in all media sampled during the RI. These comparison numbers include standards, criteria and risk-based chemical concentrations that are protective of human health and the environment for this interim remedial action. Thus, it is abundantly clear that the Ordot Landfill and the Tulalip Landfill are not "remarkably similar", and that the commentor's comparisons of the Tulalip Landfill to the Ordot Landfill are without merit.

It is also clear that one of the primary reasons Region chose a no action alternative was the fact that the operating areas of the Ordot landfill would adversely affect any remedial action EPA would have mandated for the small inactive areas of the Ordot Landfill. In fact, the no action ROD for the Ordot Landfill states that EPA will continue to monitor the effectiveness of measures taken by Guam **15** to install the proper leachate collection systems and capping, and that "[i]n choosing the no action alternative EPA reserves its authority to perform additional response actions should the new information warrant such a decision." Thus, EPA Region 9 recognized the fact that it may yet have to take action at the Ordot Landfill in order to protect human health and the environment.

2.8.2 Additional Comment Under C.l.: The commentor, in his footnote #28, states that there are other Region 10 documents which "belie the Proposed Plan's expressed concern with leachate discharges from the Site." The commentor goes on to suggest that these previously-drafted Region 10 site documents indicate that the risks posed by the Site are not as serious as the Region has indicated in the Proposed Plan.

Response: The interim action ROD determines that discharges from the landfill, if not addressed, may present an imminent and substantial endangerment to human health and the environment. This determination is based on relatively recent RI/FS documents, including the final Remedial Investigation (RI) report, the Revised Feasibility Study for Source Area Containment (FS), and the Risk Assessment for Interim Remedial Action (Streamlined Risk Assessment). The Streamlined Risk Assessment documents numerous exceedances of comparison numbers that are considered to be protective of human health and the environment at the Site in all media sampled during the RI. These comparison numbers include standards, criteria and risk-based chemical concentrations that are protective of human health and the environment for this interim remedial action. The geological and hydrogeological information contained in the RI, in combination with the Risk Assessment which shows landfill contaminants which are common across various media, indicate that the landfill is a source of chronic contamination to the surrounding sensitive environment. Based on this information, EPA appropriately concludes that contaminant discharges from the landfill may present an imminent and substantial endangerment to human health and the environment.

The commentor appears to be referring specifically to a "removal assessment" written by Bill Glasser, dated April 22, 1992 (Glasser, 1992). A copy of this document is included in the AR for this Site. Contrary to the commentor's interpretation, this document does not state that no further action is necessary at the Site. Rather, the document states that signs are necessary to warn people from using the landfill and surrounding areas, and notes that Mr. Glasser observed "no imminent or acute threats to human health or environment" at that time, based on his inspection of the Site and the information available to him at that time.

15 The territory of Guam concurred on this no-action ROD.

Removal assessments are typically conducted at all NPL sites early in the CERCLA process, and thereafter on a periodic basis. The purpose of a removal assessment is to assess whether any emergency actions need to be taken at a site prior to the start of the RI/FS. Mr. Glasser's use of the word "acute" is indicative of the

nature of the removal assessment document as evaluating the need for any emergency response actions.

The removal assessment states that "no further action by the removal program is recommended." [emphasis added]. At the time this document was written, Mr. Glasser was acting in his capacity as an On-Scene Coordinator (OSC) for the EPA Region 10 removal program. The purpose of the removal program is to conduct emergency removal actions. Emergency removal actions are often conducted at Superfund sites early in the CERCLA process to address any acute threats that constitute an emergency situation, to stabilize the site so that the longer-term remedial investigation/feasibility study and remedial design/remedial action processes can continue at the Site without endangering the lives of Site workers, or people using the areas near the Site. The conclusion of an OSC under the removal program and in particular, Mr. Glasser's decision as an OSC at the Tulalip Site, that no emergency actions are necessary at a given point in time to stabilize at Site in no way implies that the Site poses no risk which may require remedial action under CERCLA.

At the time Mr. Glasser prepared this document, he did not have access to the results of the RI, the source area containment FS, or the streamlined Risk Assessment. Presently, based on the results of the RI/FS and Streamlined Risk Assessment, EPA concludes that the Site may pose an imminent and substantial endangerment to human health and the environment. This finding suggests that action should be taken to contain discharges at the Site in a prompt and effective manner; however, discharges at these levels do not constitute an emergency situation that requires an immediate response.

EPA notes that Mr. Josie Razore and Mr. John Banchero, represented by the commentor, filed a motion in the Ninth Circuit for an emergency injunction ordering the Tulalip Tribes to immediately control leachate discharges at the Site because these leachate discharges were causing "irreparable harm" to the environment. The commentor's arguments to the Ninth Circuit on behalf of the AOC Respondents with regard to irreparable harm caused by leachate discharges from the landfill support EPA's decision to take an interim remedial action at the Site.

2.9 Comment: "C.2. Region 10 Has Arbitrarily Denied the Respondents' Requests to Test the Surface of the Landfill." [3]

Response: EPA has never denied the Respondents' request to test the surface of the landfill. EPA has declined to enter into discussions with the Respondents to amend the RI/FS Work Plan to provide for the collection of this data under the RI/FS AOC.

The Respondents initiated a formal dispute under the RI/FS AOC with respect to their request for additional surface sampling. This dispute is documented in the AR for this interim remedial action. On August 4, 1995, the EPA Region 10 Branch Chief, in accordance with the RI/FS AOC dispute resolution procedures, issued the following Determination regarding the Respondents' request to conduct additional work, including additional surface sampling (Gearheard, 1995a):

> "Tulalip Landfill Administrative Order on Consent (AOC) Dispute Resolution Branch Chief's Determination on the Request for RI/FS Work Plan Modifications"
>
> "Issues Under Dispute:
>
> The parties to the AOC have been unable to resolve a dispute which has arisen over the Respondents request to modify the Remedial Investigation/Feasibility Study (RI/FS) Work Plan at the Tulalip Landfill Superfund Site. The modifications requested include the collection of additional data to further characterize contaminant concentrations in surface water near the Site, and to further characterize contaminant concentrations in soil and standing water at the landfill. The respondents would use this information to support the Revised Source Area Containment-4 Feasibility Study (SAC-4 FS) alternatives."
>
> "EPA notified the Respondents that the Agency is not willing to amend the RI/FS Work Plan. The Respondents have objected to the Agency's reasons for not amending the work plan. The Agency's reasons include:
>
> 1. The Respondents have had ample opportunity to identify the need for any additional work to support the SAC-4 FS prior to submitting the SAC-4 FS report;
>
> 2. The request for additional work contradicts the Respondents own draft RI Report, which concludes that no further work is needed to complete the SAC-4 FS;
>
> 3. The proposal for additional work is structurally flawed and contains technical deficiencies; and
>
> 4. Collection of the additional data would result in delay of cleanup at the site."

"Background

The Respondents signed an Administrative Order on Consent (AOC, EPA Docket No. 1093-08-01-104/106) to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the site. Pursuant to this AOC, the Respondents agreed to conduct work in accordance with a Work Plan for the RI/FS which was structured in accordance with the presumptive remedy of containment for the source area. Data collection for the RI began in November 1993. The draft RI was submitted on February 4, 1995. The FS (SAC-4 report) was submitted on February 13, 1995. The Respondents then submitted a request to amend the RI/FS work plan on February 23, 1995. The requested amendment included the collection of additional soil and water data supporting the Respondents opinion that the surface of the landfill, contrary to EPA's position, does not present a risk to human health or the environment, and that groundwater discharges to the slough could achieve Ambient Water Quality Criteria (AWQC). EPA denied the request to modify the work plan on April 12, 1995."

"In accordance with paragraph 61 of the AOC, the parties have tried to resolve this dispute informally without success. The respondents served on EPA a notice of dispute (letter of Wm. Roger Truitt dated April 26, 1995). EPA and the Respondents met on May 11, 1995, but no agreement was reached. On August 4, 1995, the Respondents submitted a request for the Branch Chief's determination on the dispute. The Branch Chief's determination follows:

Determination

1. The Respondents have had ample opportunity to identify the need for any additional work to support the SAC-4 FS prior to submitting the SAC-4 FS;

The Respondents contend that the AOC allows the Respondents to identify the need for additional work at any time during the RI/FS process. The Respondents further contend that it was EPA comments in a February 3 letter on the SAC-4 report which identified the need for additional work. The Respondents objected to EPA's determination that the appropriate time to submit this request was before issuance of the (SAC-4) FS, since they had just received EPA's comments.

EPA's position is that the Respondents were erroneous in their conclusion that comments provided by EPA (as noted in your letter dated February 23, 1995) identified the need for additional data. To the contrary, EPA has determined that sufficient information has been collected to date in order for EPA to make a decision on an appropriate, protective remedy, and that further data collection is unnecessary.

Regardless of the erroneous conclusion made by the Respondents which is the basis for their request, the AOC states that EPA, in its discretion, will determine whether the additional data will be collected. Pursuant to this discretion, EPA has determined that the additional data will not be collected at this time. The appropriate time to identify the need for data collection would have been earlier in the process, (e.g., during the Remedial Investigation) so that the data could have been incorporated into the SAC-4 report without delay. The Respondents did not do so. As it is, sufficient data has already been collected by the Respondents and EPA has decided that the requested additional data shall not be collected at this time.

2. The request for additional work contradicts the Respondents' own draft RI Report, which concludes that no further work is needed to complete the SAC-4 FS;

The Respondents state that in EPA's "August 12, 1995 letter" (emphasis added) the Agency made the statement that the request for additional work contradicts the Respondents own draft RI report. For the record, this statement was made in EPA's April 12, 1995, letter. The Respondents contend that since the letter which they claim precipitated the need for additional data was not received until February 3, and the draft RI report was submitted February 4, it was impossible to include the identification of the need for additional work in the draft RI.

As stated above, in EPA's view, the Respondents misinterpreted EPA's comments presented in our February 3, 1995 letter. EPA's comments did not imply that additional data needed to be collected. To the contrary, EPA believes that the data presented in the draft RI, and additional modeling by the Respondents included in the revised SAC-4 report, confirm EPA's position that sufficient data already exist regarding the risk from the landfill surface, and groundwater migration, in order to make decisions on selecting an appropriate, protective remedy.

The Respondents dispute EPA's position that sufficient data has been collected, since the data collected to date, and the groundwater modeling conducted by the Respondents, indicate that several potential remedial alternatives are not protective and do not meet ARARs. These alternatives have thus been eliminated from the analysis of alternatives. The Respondents contend that by not agreeing to

amend the RI/FS Work Plan to allow the Respondents to collect this additional data, EPA is limiting the range of containment alternatives under consideration. The Respondents contend that collecting the additional data would be necessary to determine which of the non-capping alternatives, including those eliminated in the screening process, are consistent with the NCP.

EPA continues to maintain that the Respondents' statement in the draft RI that no further work is necessary is accurate, and contradicts the Respondents' claim that additional work is needed. EPA believes that current data allow the Agency to consider a sufficiently broad range of alternatives, as presented in the SAC-4 report, and as described in the Proposed Plan for Interim Remedial Action. EPA has determined that additional data collection support of the SAC-4 FS is not needed.

3. The proposal for additional work is structurally flawed and contains technical deficiencies;

The Respondents claim that EPA's April 12, 1995, comments do not provide enough specifics on why their additional work request is deficient, and do not provide specifics on what would be necessary to correct the flaws and deficiencies.

EPA believes the level of detail provided in its April 12 comment letter adequately pointed out the deficiencies in the Respondents proposal for additional data collection. EPA did not provide further comments on what would be needed to correct the proposal because the Agency does not believe that collecting the additional data is needed in order to support the SAC-4 report nor to make a decision on the remedy.

Therefore, EPA has determined that the Respondents' contention that EPA did not provide enough specific comments on the deficiencies of their proposal has no bearing on EPA's decision that the work is not needed.

4. Collection of the additional data would result in delay of cleanup at the site;

The PRPs contend that EPA over-estimated the amount of time it would take to complete the additional data collection, and that the work could be completed in time described by the Respondents in their February 23, 1995 letter (final SAC-4 report by August 31, 1995).

EPA maintains its position that the Respondents significantly under-estimated the amount of time necessary conduct the additional work. EPA maintains that it would take much longer to carry out the necessary steps: review, comment, negotiate work plan, EPA approval of work, conduct field activities, data analysis and review, report preparation, EPA review and approval of final SAC-4 report. EPA has determined that collection of the additional data would delay the agreed upon schedule for completion of SAC-4 report, and this delay is unnecessary since sufficient data has been collected to date."

The Respondents subsequently appealed the Branch Chief's Determination to the EPA Region 10 Regional Administrator. On October 18, 1995, the Deputy Regional Administrator, acting for the Regional Administrator, issued the following decision regarding additional surface sampling (Findley, 1995a):

"EPA's Final Determination: The Respondents request to perform additional work is denied. The rationale for this decision follows.

The Respondents asserted in their dispute that the AOC allows the Respondents to identify the need for additional work at any time during the RI/FS process. The Respondents also asserted that it was EPA comments in a February 3, 1995 letter which raised the need for the collection of additional data to support the FS. Since the SAC-4 FS report was submitted by the Respondents only 10 days after receiving EPA's comments, the Respondents asserted that they had an inadequate time to respond to EPA's comments before submitting the SAC-4 FS report. Therefore, the Respondents asserted that their request was not untimely. The Respondents also asserted that the request was not inconsistent with the RI and believed that EPA did not adequately explain the deficiencies in their additional work proposal.

The Branch Chief, in his August 4, 1995 determination, wrote that the Respondents were erroneous in concluding that EPA's February 3, 1995 comments identified the need for collecting additional data. The Branch Chief cited the AOC, which states that EPA, in its discretion, will determine whether additional data will be collected. The Branch Chief upheld the Remedial Project Manager's (RPM's) position (as detailed in his April 12, 1995 letter) that sufficient data had been collected to date upon which to make a decision on a appropriate, protective cleanup remedy using the presumptive remedy approach outlined in the AOC. The Branch Chief also upheld the RPM's position that the Respondents request was untimely, was inconsistent with the draft RI, and contained structural flaws and deficiencies.

> My review of the record concludes that EPA reasonably evaluated the Respondents' request for additional work, and concluded that the work was not necessary to support the objectives of the RI/FS. In their review, the RPM and the Branch Chief also determined that the request for additional work was untimely and would cause delays in the cleanup. Although the RPM had determined that the additional work was unnecessary, his preliminary review identified several deficiencies in the proposed work. I find that the decisions by EPA staff and the Branch Chief are consistent with EPA authorities under CERCLA and the National Contingency Plan. Further, Paragraph 36 of the AOC, an agreement signed by the Respondents, specifically provides that EPA's decision on additional work is at its discretion. I find that the record shows that the RPM and the Branch Chief reasonably determined that no additional work was necessary, and that EPA decided, at its discretion, to not authorize the work suggested by the Respondents. For these reasons, I uphold the decision of the Branch Chief to deny the Respondents' request for additional work.
>
> This determination is EPA's final decision on this dispute."

EPA's decision not to amend the RI/FS Work Plan to allow for additional sampling of the landfill surface was therefore reasonable and justified, as EPA carefully considered all of the Respondents' points and concerns before EPA issued its final decision regarding these disputes. Additional correspondence regarding this dispute is included in the AR for this interim remedial action. See also Response to Comment 2.9.1.

2.9.1 Additional Comment Under C.2.: The commentor also states that, had EPA approved the AOC Respondents' requests to amend the RI/FS workplan to allow the testing of the surface of the landfill in a timely manner, these results would have been available at the time of issuance of the streamlined Risk Assessment and the Proposed Plan for this interim remedial action.

Response: The AR shows that EPA responded in a timely fashion to the Respondents' requests for additional work. Both the EPA Branch Chief's Determination (Gearheard, 1995a), and the EPA Regional Administrator's decision (Findley, 1995a), note that the Respondents' request was untimely. In addition, given the Respondents' lack of consistent timeliness in submitting RI data, EPA did not have reason to believe that the Respondents would produce this additional surface data prior to issuance of the Streamlined Risk Assessment and Proposed Plan. All final RI data of acceptable quality was due on May 4, 1995, with the final RI Report. Some of this data was provided to EPA as late as October, 1995, well after the streamlined Risk Assessment was finalized and the Proposed Plan issued. EPA was also concerned that competition for analytical resources needed for the additional surface sampling may have contributed to longer delays in submitting the late RI/FS Work Plan data that was submitted in October 1995. Therefore, EPA believes that it has acted reasonably in denying the AOC Respondents' requests to conduct more extensive surface soil sampling at the Tulalip Landfill, after fully considering the need for additional data and the potential for delay in addressing the ongoing discharges of hazardous substances into the environment.

2.9.2 Additional Comment Under C.2.: The commentor suggests that the 1988 surface data used by EPA as part of the streamlined Risk Assessment was "limited and unreliable" data. [8] [17]

Response: EPA included 1988 surface data in the streamlined Risk Assessment, not for the purpose of fully characterizing the entire landfill surface, but to point out that existing site data from 1988 indicates that some locations of the landfill surface were contaminated at the time those samples were taken. At the sample locations, hazardous substances were found at levels that exceeded comparison numbers that are considered to be protective of human health and the environment at the Site in all media sampled during the RI. These comparison numbers include standards, criteria and risk-based chemical concentrations that are protective of human health and the environment for this interim remedial action. EPA agrees that 5 samples are an insufficient number of samples to fully characterize the 147 acre landfill surface, and that the 1988 data is significantly older than RI/FS data. However, sampling of the landfill surface is not necessary to proceed with a presumptive remedy at municipal landfill sites. As the EPA guidance document "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA, 1993a) states on page 5:

> "A quantitative risk assessment...is not necessary to evaluate whether the containment remedy addresses all pathways and contaminants of concern associated with the source."
>
> * * *
>
> "Streamlining the risk assessment of the source area eliminates the need for sampling and analysis to support the calculation of current or potential future risk associated with direct contact."

These EPA policy statements clearly indicate that EPA believes it is not necessary to sample the landfill surface before making a decision to proceed with an interim action to contain the landfill wastes. However, because the 1988 data was available and considered reliable by EPA, it was included it in the Streamlined Risk Assessment.

Recent surface water data collected by the Respondents during the RI/FS at leachate seep SP-01 supports the 1988 data because it indicates that, at this location, surface water contamination on the landfill surface still exists. Sampling data from seep SP-01, the only leachate seep sampled during the RI/FS which originates on the landfill surface, exceeded comparison numbers that are protective of human health and the environment (see interim ROD, Table 11-1). See also Response to Comments 10.1 - 10.4 for responses to comments about the quality of the 1988 data.

2.9.3 Additional Comment Under C.2.: The commentor asks why EPA considers the 1988 data to be adequate, while EPA considered the Respondents' proposal for additional surface sampling to be inadequate.

Response: The Respondents' request to conduct additional surface samples was the subject of a formal dispute (see Response to Comment 2.9 for a complete explanation of why EPA declined to amend the AOC to conduct this additional sampling). EPA does not maintain that the five surface soil and surface water samples taken in 1988 are sufficient to "adequately" characterize the entire landfill surface. However, in EPA's view, because the 1988 data is available and EPA considers it to be reliable, it is appropriate to include this available data in the Streamlined Risk Assessment. EPA believes the 1988 data does adequately characterize landfill surface conditions at those 5 sample locations at the time they were taken, even though 5 sample locations cannot be considered representative of the entire landfill surface.

It should be noted that EPA guidance on presumptive remedies, which is consistent with the NCP, does not require EPA to fully characterize any medium before making a decision on whether remedial action is warranted to address contamination in that medium.

See also Response to Comments 10.1 - 10.4 for responses to comments about the quality of the 1988 data.

2.9.4 Additional Comment under C.2.: The commentor states that EPA used unreliable data (the 1988 data) to rule out non-capping alternatives in the Proposed Plan, and that even the 1988 data fail to show a risk to human health and the environment.

Response: The 1988 surface data was given appropriate consideration by EPA during the remedy selection process, acknowledging the limited number of samples and the age of the data. The 1988 surface data was not a critical factor in eliminating any alternatives from consideration, nor in EPA's selection of Alternative 4c as the most appropriate alternative for interim remedial action. If the 1988 surface data had been set aside and not considered at all by EPA, the comparative analysis of alternatives in the interim ROD would still have led EPA to conclude that Alternative 4c provides the best balance of trade-offs with respect to the nine criteria in addressing the remaining pathways of concern. **16**

Alternative 4c was selected in the interim ROD because it provided the best balance between the nine NCP criteria and met the remedial action objectives. Some of the other alternatives would have met the remedial action objective of prevention of direct contact; however, those alternatives were ruled out in the interim ROD based on an analysis of the nine NCP criteria and their ability to meet the other remedial action objectives.

EPA disagrees with the commentor's assertion that the 1988 data show no threat to human health and the environment. "Table 6-4 - Summary of On-Source Data that Exceed Ecological Comparison Numbers" from the ROD indicates that, in 1988, at 5 sample locations on the landfill surface, concentrations of the following chemicals in surface water exceeded comparison numbers that are considered protective of ecological resources:

Chemical	Frequency of Exceedances
Phenanthrene	1/5
Bis(2-ethylhexyl)phthalate	1/5
Cadmium - total	1/5
Chromium - total	2/5
Copper - total	4/5
Iron - total	5/5
Lead - total	2/5
Nickel - total	3/5
Zinc - total	4/5

16 These pathways include leachate passing through the perimeter landfill berm and discharging to wetlands, leachate on the landfill surface (SP-01), zone 2 groundwater, off-source surface soils, off-source subsurface soils, off-source surface sediments, and off-source subsurface sediments. locations, and does not fully characterize the 147-acre area, consideration of this data is still useful and appropriate because it represents conditions at five locations on the landfill surface in the relatively recent past. See also Responses to Comments 10.1 - 10.4.

In addition to these 1988 surface water exceedances of comparison numbers, EPA notes that the 1988 surface soil data exceeded the comparison number for bis(2-ethylhexyl)phthalate at one sampling location. Based on these exceedances of comparison numbers, EPA believes it is reasonable to conclude that in 1988, at these five sampling locations on the landfill surface, surface water presented a potential risk to the environment. Though the 1988 data may not be representative of current conditions at these sample

2.10 Comment: "C.3. Region 10 Has Arbitrarily Refused to Allow the Respondents to Conduct Tests Related to the Discharge of Zone 2 Groundwater to Surface Water." [3]

Response: See Response to Comment 2.10.3.

2.10.1 Additional Comment Under C.3.: The commentor states that EPA is incorrect in expecting that Alternative 4c in the Proposed Plan will eliminate the migration of leachate into Zone 2 groundwater in the short term.

Response: EPA disagrees with the commentor regarding the effectiveness of Alternative 4c in eliminating migration of leachate into Zone 2 groundwater. As was stated by the Respondents in the Revised SAC-4 RI/FS that they prepared, on pages 87-89 (discussing Alternatives 4b and 4c), the low permeability cover (or "cap") for Alternative 4b:

> "... essentially eliminates infiltration and leachate generation, thereby eliminating seep and groundwater migration and achieving all the seep and groundwater RAOs [remedial action objectives] .... "

The permeability of the cover discussed in Alternative 4b is the same as would be required for Alternative 4c. Thus, the AOC Respondents' own consultant agrees with EPA regarding the effectiveness of the cap required by the selected alternative, Alternative 4c.

In addition, the Proposed Plan on page 10 states that Alternative 4c "... is expected to eliminate the perimeter berm leachate seeps within two years, and basically eliminate the generation and migration of leachate in the deeper groundwater to the sloughs." It may be true that Alternative 4c will allow more leachate to be released into the environment in the short term than Alternative 2b, which is the alternative supported by the Respondents. However, in the long term, Alternative 4c would release significantly less leachate than Alternative 2b, thereby reducing the amount of mass contaminant loading to the environment (mass contaminant loading was identified in the Streamlined Risk Assessment as on of the primary risk concerns at the Tulalip Site). The NCP gives preference to long-term effectiveness over short-term effectiveness. See 55 Fed. Reg. 8725; 40 C.F.R. section 300.430 (f) (1) (ii) (E). Construction of Alternative 4c will allow the existing leachate mound within the landfill waste to dissipate gradually, by the force of gravity, through the perimeter leachate seeps and downward into Zone 2. Once the leachate mound recedes, the cover, by preventing new infiltration of precipitation, effectively prevents the generation and migration of new leachate. In contrast, Alternative 2b (if it were to work as well as the Respondents have predicted) would allow a greater initial leachate reduction by reducing the volume of the existing leachate mound more quickly, but would continue to allow significant amounts of leachate to migrate into the environment in perpetuity.

"Comparison of the Leachate Collection and Treatment Alternative (2b) with the FML Cover Alternative (4c), Golder Associates, October 24, 1995" (Golder, 1995b) compares the cumulative leachate flow out of the landfill into the environment of Alternatives 2b and 2b(ii) with that expected for Alternative 4c. Figure 4-2 from the above Golder report (Golder, 1995b) **17** shows that, for approximately fifteen years, alternatives 2b and 2b(ii) are expected to allow slightly less leachate to escape into the environment. However, with Alternative 4c, after this 15 year period, leachate production subsides. In contrast, under Alternatives 2b and 2b(ii), the leachate continues to escape from the landfill at a rate of approximately 80 million gallons every 10 years in perpetuity. If the collection system proposed for Alternatives 2b and 2b(ii), an unproven technology, turns out to be less effective than the Respondents have predicted (a distinct possibility, given that alternatives 2b and 2b(ii) are unproven technologies), the predicted leachate escapement rate for these alternatives of 80 million gallons every ten years could be substantially higher.

> **17** A copy of this figure is provided for the convenience of the reader at the end of Appendix D in Attachment C.

2.10.2 Additional Comment Under C.3.: The commentor suggests that the RI/FS sampling showed that there were no exceedances of surface water quality criteria at any location.

Response: EPA disagrees with this comment. Excluding leachate data collected from the perimeter leachate seeps, there were three surface water samples taken outside the landfill perimeter during the RI/FS that exceeded surface water comparison numbers: one exceedance of arsenic and one of dibenz(a,h)anthracene at

sample location Rl-SW-SC24-S2 that exceeded human health comparison numbers, and one exceedance of lead that exceeded the ecological comparison number at sample location Rl-SW-SG37.

In addition to these three exceedances of water samples that were specifically referred to as "surface water" samples in the RI/FS Work Plan, samples taken from the perimeter leachate seeps are also a type of surface water sample, even though they are explicitly referred to in the RI/FS Work Plan as "leachate seep" samples. Under Washington state law, which requires the application of ambient water quality criteria to be measured at the point where groundwater enters surface waters,**18** the comparison number exceedances measured in the perimeter berm leachate are exceedances of surface water criteria. EPA notes that numerous chemicals were found in the leachate seep waters, and that the levels of many chemicals exceeded the comparison numbers that are considered to be protective of human health and the environmental resources. See Tables 6-2, 6-4, and 6-5 in the interim ROD for more specific information regarding leachate seep exceedances. Thus, it is EPA's position that the numerous samples of leachate seeps outside the perimeter of the berm, demonstrate that surface waters are contaminated by discharges from the Site.

The RI/FS approach for evaluating Zone 2 groundwater was to measure groundwater chemical concentrations at 13 perimeter landfill berm wells. Using this data from the berm wells, the Respondents used a groundwater modeling technique to estimate the contaminant concentrations that would be expected at the location where Zone 2 groundwater enters the sloughs, which is where State Water Quality Criteria must be measured according to Washington state law that EPA has identified as being relevant and appropriate for this Site. The results of this groundwater modeling indicated that, in general, one would expect to see contaminants in the berm wells diluted by a factor of 5 to 9 from the time they leave the perimeter berm wells to the time they reach the sloughs. Taking these dilution factors into account, exceedances of comparison numbers at the Zone 2/slough interface would be expected. See Section 6.0 of the interim ROD. Ammonia nitrogen exceeds comparison number for all samples taken at the high end of the predicted concentration reduction range (73 of 73). Based on the exceedances of comparison numbers in Zone 2 groundwater in the berm wells and predicted through groundwater modeling at the sloughs, it is appropriate to conclude that discharges from the landfill are resulting in exceedances of human health and ecological comparison numbers at the Zone 2/slough interface, which represents a potential threat to human health and the environment.

18 No mixing zones in surface water (i.e., the sloughs) are permitted under State law for measuring compliance with these discharges. This issue of mixing zones in surface water was the subject of a formal dispute resolution process under the RI/FS Administrative Order on Consent. See Response to Comment Section 2.9 for more information on this dispute. See ROD Section 11.2- Compliance with ARARs.

2.10.3 Additional Comment Under C.3.: The commentor states that EPA denied the Respondents' proposal to amend the RI/FS workplan to perform Zone 2/surface water interface testing for the "same reasons" that EPA denied their request to test the surface of the landfill.

Response: The Respondents' request to install additional groundwater sampling wells in the wetlands surrounding the landfill was the subject of a formal dispute under the RI/FS AOC. In accordance with the AOC, the EPA Region 10 Branch Chief issued a Determination regarding the Respondents' request. The Respondents appealed this decision to the EPA Region 10 Deputy Regional Administrator, who subsequently issued a decision on this matter. The Branch Chief's Determination and the Deputy Regional Administrator's Decision are provided above in EPA's Response to Comment 2.9.

2.10.4 Additional Comment Under C.3.: The commentor states that the AOC Respondents disagreed with EPA regarding whether an aquatic biota inventory was needed under the RI/FS to show effects of Zone 2 groundwater discharges, which Respondents believe is necessary in order to define risks posed by the site.

Response: As EPA concluded during the formal dispute process, and adequate biota inventory already exists for the Site (Weston, 1992); therefore, a second inventory is not necessary. In addition, there are biological inventories available for the Snohomish River Delta in general (NOAA, 1991). See also Response to Comment 11.45. EPA's presumptive remedy guidance does not require EPA to show that there are specific organisms at the Site that could be harmed by specific chemicals." The purpose of the presumptive remedy approach is to streamline the RI/FS and Risk Assessment process so that expenditures of time and money are reduced while ensuring that an appropriate remedy is selected. The presumptive remedy approach allows EPA to compare site sample data (contaminant concentration levels) against standards and criteria (some of which were later identified as chemical-specific ARARs in the interim ROD), and against risk-based chemical concentrations if standards or criteria are unavailable. Where established standards for one or more contaminants in a given medium are clearly exceeded, remedial action is generally warranted **20**, and selection of a containment remedy to address the potential pathway(s) posed by that medium is appropriate. EPA concludes that based on numerous exceedances of state surface water comparison numbers in groundwater at the site, and based on the results of the Respondents' modeling that shows that some of these contaminants are unlikely to meet state water quality standards at the Zone 2/slough interface (see Responses to Other Comments in Section 2.10), remedial action

is warranted to address the Zone 2 groundwater pathway.

19 However, Appendix B of the Risk Assessment for Interim Remedial Action contains information about specific species that are present at the Site which could be harmed by chemicals that are discharging from the landfill.

20 See "Presumptive Remedy of CERCLA Municipal Landfill Sites" (EPA, 1993a, page 4.)

2.11 Comment; "C.4. Region 10 Arbitrarily Dictated the Content of the Respondents' SAC Reports" [3]

2.11.1 Additional Comment Under C.4.: The commentor also states that despite EPA's approval of the Respondents' contractors, EPA has rejected numerous recommendations and conclusions made by the Respondents' contractors. The commentor also states that EPA initially denied the collection of dissolved metals data, and then EPA severely limited its use in evaluations by the Respondents' contractors, despite EPA's use of dissolved metals data at other sites. The commentor then states that EPA did not offer a rational basis for not allowing the Respondents to perform additional testing.

Response: EPA disagrees that the Agency has arbitrarily dictated the content of the Respondent's SAC reports. To the contrary, EPA has provided the Respondents with a clear record showing how EPA's comments and decisions on all of the SAC Reports have been made consistent with CERCLA, the National Contingency Plan (NCP), and the Agency's authority under the Administrative Order on Consent (AOC), under which the SAC reports were developed by the Respondents. Pursuant to this AOC, the Respondents agreed to develop cleanup alternatives using the presumptive remedy of containment. The AOC states that EPA makes the final decision on the contents of all reports. EPA retained a respected consulting firm (Roy F. Weston, Inc.) to provide expertise and assistance in reviewing the SAC reports submitted by the Respondents. EPA also used qualified and competent in-house technical advisors in preparing comments on SAC reports.

Using this expertise, EPA evaluated cleanup alternatives proposed by the Respondents against the nine criteria outlined in NCP. Those alternatives which met the two threshold criteria protection of public health and the environment, and compliance with applicable or relevant and appropriate requirements (ARARs) were retained for further consideration. The alternatives which were retained were then evaluated against the remaining seven NCP criteria. EPA chose Alternative 4c as the alternative which provided the best balance of all nine NCP criteria. See interim ROD Section 9.0 - Summary of Comparative Analysis of Alternatives. EPA also determined that Alternative 4c is cost effective (see interim ROD Section 9.0).

The Respondents have cited EPA's rejection of some non-capping alternatives as an indication that EPA arbitrarily dictated the contents of Feasibility Study reports. EPA disagrees that it has arbitrarily dictated the contents of the SAC Reports. EPA's basis for rejecting the non-capping alternatives is discussed in detail as part of a dispute with the Respondents and is included in the AR for this site. To summarize, EPA excluded two non-capping alternatives, Alternatives 3a and 3b, from further consideration in the Feasibility Study because, contrary to the Respondents' claim, these alternatives do not meet the two threshold NCP criteria (protectiveness and compliance with ARARs), and because they are inconsistent with the presumptive remedy of containment. See interim ROD Section 8.12 - Other Alternatives.

The Respondents also state Region 10 has rejected evaluations and conclusions presented by the Respondents' experts in the course of preparing the cleanup alternatives. The Respondents provide two examples, EPA's limitations on the use of dissolved metals data, and EPA's denial of the Respondents' request for additional field work to collect additional data. Both of these issues were also part of disputes with the Respondents under the terms of the AOC. (The dispute regarding the collection of dissolved metals samples was resolved informally.) These disputes were resolved by letters from the Deputy Regional Administrator of EPA, and are part of the AR for the site (Gearheard, 1995b, Findley, 1995b). See also Response to Comment 2.9. As for additional field work requested by the Respondents, EPA decided that the additional work was not needed in order to select a reasonable, cost-effective cleanup remedy, containment of the source area. The record shows that EPA provided a rational basis for these decisions. Correspondence with the Respondents dated April 12, 1995, (Winiecki, 1995e),also provides the rationale for EPA's decision.

2.12 Comment: "C.5. Region 10's Reliance on the State of Washington's Current Landfill Regulations as an ARAR is Unlawful and Inconsistent With State Practice."[3]

2.12.1 Additional Comment Under C.5.: The commentor states that the current state of Washington Minimum Functional Standards ("MFS") for landfill closure, codified at WAC Chapter 173-304, are not relevant and appropriate requirements for the Tulalip Site.

Response: EPA disagrees with the commentor's statement that the current MFS for landfill closure are not relevant and appropriate requirements for this interim remedial action at the Tulalip Site. A detailed

discussion of the relevancy and appropriateness of these regulations can be found in Section 11.2 of the interim ROD. To summarize, the Tulalip Reservation is surrounded on all sides by land which is under the jurisdiction of Washington State. If the landfill were located one mile south of its current location, outside the Reservation boundaries, the MFS regulations would be legally applicable if a cleanup action were selected. However, Washington State regulations are not applicable to this interim remedial action because the landfill is located wholly within the boundary of the Tulalip Indian Reservation, and under federal law the laws of the state of Washington are not enforceable within the boundaries of the Tulalip Indian Reservation. The Tulalip Tribes have no landfill closure requirements that are comparable to state landfill closure requirements; therefore, EPA has determined that MFS shall be considered relevant and appropriate to this interim remedial action, because those state landfill closure requirements contain provisions relating to landfill cover construction and landfill gas control. The remedial action objectives set out in the interim ROD require, among other things, that the selected interim remedy "prevent direct and skin contact with, and ingestion of landfill contents and contaminated soils, eliminate migration of leachate that exceeds ambient marine water chronic criteria," and that the remedy "prevent inhalation and release of landfill gas." The components of EPA's presumptive remedy for municipal landfills (containment) include a landfill cover. See OSWER Dir. No. 9355.0-49FS (EPA, 1992a, pg.2.) The closure requirements of WAC 173-304 were meant to address problems or situations at municipal solid waste landfill sites which are sufficiently similar to those encountered at the Tulalip Site (and identified as the remedial action goals for the Tulalip Site), such that the use of the WAC 173-304 closure requirements is well-suited to the Tulalip Site. Thus, EPA has determined that the WAC 173-304 requirements for landfill covers are relevant and appropriate to this interim remedial action at the Tulalip Landfill Site. See also interim ROD Section 11.2 (which also identifies the federal landfill closure requirements, codified at 40 C.F.R. § 258.60, as an ARAR for this Site).

2.12.2 Additional Comment Under C.5.: The commentor also states that the MFS requirements cannot be ARARs for the Tulalip Site as those requirements apply only to landfills which have closed after the effective date of the regulations (November 3, 1988), and the commentor believes that the Tulalip Landfill completed closure in 1979. The commentor also states that MFS cannot be an ARAR for this Site because the State of Washington never identified it as an ARAR, as is required by the NCP.

Response: EPA disagrees with the commentor regarding the status of the MFS and ARARs at the Tulalip Site. In EPA's view, the selected alternative is a cost effective interim containment action that is expected to address effectively the ongoing discharges of contaminants from the Site. The selected alternative, 4c - Geosynthetic Cover with Passive Drainage, is the least expensive alternative that complies with Washington State Minimum Functional Standards (MFS) for landfill closures. As stated in the response above, EPA has determined that the MFS are relevant and appropriate requirements for the Tulalip Landfill. These standards are, as they are called, minimum closure standards that have been established by the State for proper landfill closure. An MFS cap has a minimum number of low permeability layers (one), and requires that the surface slopes of the cover to be constructed at a grade not less than 2 percent. A two percent grade is considered to be the minimum grade necessary for adequate surface drainage.

An MFS cap is a relatively low cost cap, compared to some types of caps that have been selected at other NPL sites. At the Tacoma Landfill NPL site, for example, a cap that complies with the requirements of the Resource Conservation and Recovery Act (commonly referred to as a "RCRA cap") was selected and constructed. RCRA caps are considerably more expensive than MFS caps because they require two impermeable layers instead of one. Generally speaking, a RCRA cap will comply with MFS requirements, but an MFS cap will not comply with RCRA. RCRA requirements are more stringent.

While the Tulalip site closure may have been legal at the time, and even accepted by EPA at the time, the closure requirements at that time were not effective at preventing the site from becoming a long term environmental problem. This is evidenced by the data collected during the 1988 site inspection and the RI/FS data, which documented large volumes of contaminated leachate leaving the site.

Since the Tulalip Landfill was closed, the State of Washington (and EPA - see 40 C,F,R,: Part 258) has made the requirements for landfill closure significantly more stringent. The State has acknowledged that the previous landfill closure requirements were inadequate, and recognized the need for improved closure standards to help ensure that closed landfills would not threaten human health and the environment. This appears to be the case at Tulalip Landfill. Today, observing the data that has been collected at the site after the 1979 closure, it is clear that the 1979 closure, believed adequate at that time, was insufficient. This insufficiency may not have been apparent in 1979, and it may not have been apparent when EPA agreed that the landfill had been closed in accordance with the 1977 Consent Decree, but its insufficiency is apparent today.

In addition, if one were to take the commentor's argument regarding the applicability of the current MFS to the Tulalip Landfill to its logical conclusion, one would have to conclude that the only laws that could be ARARs at any Superfund site are those laws that were in effect when a given site "ceased operations" and/or "closed." Clearly, that was not what Congress intended when it promulgated Section 121 of CERCLA. Congress' intent under Section 121 CERCLA was to have remedial actions require the "level or standard of control for

such hazardous substance or pollutant or contaminant which at least attains such legally applicable or relevant and appropriate" requirements. See 42 U.S.C. § 9621(d)(2)(A). In the legislative history of Section 121, Congress also stated with regard to the issue of "relevant and appropriate" environmental laws and Acts that:

> "[t] hese Acts need not be legally applicable. The Administrator [of EPA] is to look to the standards in all of the acts which apply to a particular release or a threatened release and determine whether or not application of the standards in the other acts is reasonable and sensible under the circumstances. In determining whether a standard or criterion established under any other Federal or state environmental statute is applicable to cleanup of a facility subject to remedial action, the Committee does not intend that such standard or criterion should only be applied where the jurisdictional or procedural requirements of such laws are technically met. For example, the regulatory requirements of the SDWA apply only to certain specific sources of public drinking water. The Federal Water Pollution Control Act [FWPCA] contains similar procedural restrictions. Nevertheless, the Committee intends that all standards and criteria developed under both statutes shall apply to Superfund response actions when the bodies of water at issue will be used for similar purposes as those identified in the [SWDA], or the [FWPCA], or where such bodies of water present similar opportunities for human exposure and adverse effects on human health or the environment as are presented by the environmental media regulated under the other statutes." (Emphasis added). See House Comm. on Public Works and Transportation, Superfund Amendments of 1985, H.R. Rep. No.253, 99th Cong., 1st Sess., pt.5, at 54 (November 12, 1985). See, also 40 C.F.R. § 300.5 (definition of "relevant and appropriate requirements" in the NCP)

Thus, it is clear that Congress intended that Federal and state environmental laws such as the current State of Washington MFS may be considered by EPA to be an ARAR for the Tulalip Landfill Site, despite the fact that the current MFS do not "technically" apply to the Tulalip Landfill because it ceased operations in 1979.

Finally, EPA has determined that current MFS are relevant and appropriate requirements for the Tulalip Landfill interim remedial action because some of the purpose contact with the landfill contents and minimize leachate generation) are similar to the purposes of the MFS in WAC 173-304 (to prevent contact with landfill contents after closure and to minimize and/or eliminate generation of leachate). See, generally, WAC 173-304-460(2)(a), -460(2)(c), and -460(3)(a). The definition of "relevant and appropriate requirements" in the NCP states that a relevant and appropriate requirement is one that:

> "...while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site." 40 C.F.R. § 300.5.

Thus, EPA has determined that the current MFS for closure of landfills is well suited to the Tulalip Site, as a MFS-compliant cover design would meet the remedial action objectives for the Site.

The commentor's assertion that the State has not identified MFS as an ARAR is without merit. The State has no civil jurisdiction on the Tulalip Indian Reservation, and therefore the State has no requirement to identify ARARs for the Site because under federal law the State law is not enforceable.

2.12.3 Additional Comment Under C.4.: The commentor states that the MFS are "action-specific" ARARs which become ARARs only after a determination is made that a landfill cover is necessary to protect human health and the environment.

Response: EPA agrees that MFS are identified as "action-specific" ARARs in the "CERCLA Compliance With Other Laws" manual, but EPA disagrees with the remainder of this comment. The potential ARARs for the Tulalip Landfill Site were developed as part of the ongoing RI/FS for the site. Since the Tulalip Landfill is similar to a solid waste landfill in that the wastes are heterogeneous and large in volume and thus treatment of such wastes would be impracticable, and EPA has determined that remedial action is necessary at this site, it follows that federal and state laws governing the proper closure of municipal landfills would be potential ARARs for this site. As such, EPA has identified the MFS under WAC Chapter 173-304 as an ARAR in the interim ROD. Under Section 121 of CERCLA, the MFS requirements apply to solid waste landfills on the NPL located on land subject tot he laws of the state of Washington. However, since the Tulalip Landfill is located on Tribal lands, the MFS requirements are not applicable, but instead are clearly relevant and appropriate specifications for proper closure of this landfill. Since the MFS regulations are ARARs for the Tulalip Landfill, if EPA were to select and alternative which did not meet the MFS requirements, EPA would have to waive the MFS ARAR of find that the MFS are either not relevant or not appropriate for this site. EPA guidance **21** states:

"In the absence of Federal Subtitle D closure regulations, State Subtile D closure requirements generally have governed CERCLA response actions at municipal landfills as applicable or relevant and appropriate requirements (ARARs). New Federal Subtitle D closure and post-closure care regulations will be in effect on October 9, 1993 (56 Fed. Reg.50978 and 40 C.F.R. Part 258). State closure requirements that are ARARs and that are more stringent that the Federal requirements must be attained or waived." (Emphasis added).

21 Presumptive Remedy for CERCLA Municipal Landfill Sites (EPA, 1993a, page 7.)

Both Federal Subtitle D closure regulations codified at 40 C.F.R. Part 258, and MFS for landfill closure codified at WAC 173-304 have been identified in this interim ROD as ARARs for the Tulalip Landfill.

2.12.4 Additional Comment Under C.5.: The commentor states that Region 10's "arbitrary" application of the MFS regulations as an ARAR is "highlighted" by recent actions taken by the state of Washington at the Everett Landfill/Tire Fire Site.

Response: EPA disagrees with the commentor that EPA has "arbitrarily" applied any ARARs at the Tulalip Landfill Site. In comparing the Everett Landfill to the Tulalip Landfill, the commentor fails to recognize that the Everett Landfill is not on the NPL. The Tulalip Landfill is on the NPL, and therefore EPA must follow CERCLA and the NCP when investigating the site and developing remedial alternatives. Section 121 of CERCLA states that the remedial action selected for a given site must attain the standards set out in state environmental laws that are more stringent than federal law. However, the only standards which can legally be ARARs under Section 121 are those standards which are "promuglated" at the time the remedial action is selected. Thus, EPA cannot consider (as suggested by the commentor when he proffers the Everett Landfill as a comparison) the old MFS, which were codified at WAC 173-301, as these regulations are no longer in effect and in 1985 were superseded by the WAC 173-304 regulations.

In addition, Section 300.5 of the NCP defines "relevant and appropriate requirements" to be those state standards that are identified in a timely manner and which "are more stringent than federal requirements." See 40 C.F.R. § 300.5. The old landfill closure requirements generally called for the installation of a cover that consisted of approximately 2 feet of soil with adequate drainage. The current federal municipal landfill requirements (codified at 40 C.F.R. Part 258) regarding solid waste landfill cover requirements for closure require, inter alia, a landfill cover with a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1x10-5 cm/sec, whichever is less. Therefore, since that WAC 173-301 closure requirements are less stringent than the current federal municipal landfill closure requirements, EPA cannot consider the old, less-stringent WAC 173-301 requirements as ARARs when making remedial action decisions at the Tulalip Landfill Site.

2.13 Comment: "C.6. Region 10's Proposed Plan Capriciously Mischaracterizes the Site's Environs." [3]

Response: EPA disagrees with the commentor. The AR contains an abundance of information indicating that the wetlands surrounding the landfill are of great ecological significance. The "Shoreline of Statewide Significance" and the "AMBS" designations are not the sole reasons upon which EPA is basing the selected interim remedy. Rather, these designations, in combination with other information provided in the AR, reflect the importance of the surrounding areas. It is important to realize that the potential impacts of the landfill leachate discharges are not limited to the immediate area surrounding the landfill.

Contaminants from the landfill flow into Ebey and Steamboat Sloughs, and then into Puget Sound. The Puget Sound estuary, which includes the Tulalip Landfill, is an estuary of national significance. Puget Sound is one of 28 estuaries in the United States that are currently part of the National Estuary Program (NEP), which was established under the Clean Water Act. The NEP's mission is to protect and restore the health of estuaries while supporting economic and recreational activities. An EPA document entitled "National Estuary Program: Bringing Our Estuaries New Life" (EPA/842/F/93/002) defines an estuary, explains the significance of estuaries, and provides some information on some of the problems of estuaries in the program. The following is excerpted from the document:

"WHAT IS AN ESTUARY?

An estuary is a costal area where fresh water from rivers and stream mixes with salt water from the ocean. Many bays, sounds, and lagoons along coasts are estuaries. Potions of rivers and streams connected to estuaries are also considered part of the estuary. The land area from which fresh water drains into the estuary is its watershed.

WHY ARE ESTUARIES SIGNIFICANT?

Estuaries are significant to both marine life and people. They are critical for the survival of

fish, birds, and other wildlife because they provide safe spawning grounds and nurseries.

Marshes and other vegetation in the estuaries protect marine life and water quality by filtering sediment and pollution. They also provide barriers against damaging storm waves and floods.

Estuaries also have economic, recreational, and aesthetic value. People love water sports and visit estuaries to boat, fish, swim, and just enjoy their beauty. As a result, the economy of may coastal area is based primarily on the natural beauty and bounty of their estuaries. Estuaries often have ports serving shipping, transportation, and industry. Healthy estuaries support profitable commercial fisheries. In fact, almost 31 percent of the Gross National Product is produced in coastal counties. This relationship between plants, animals, and humans makes up an estuary's ecosystem. When its components are in balance, plant and animal life flourishes. Because of our love of water, almost half of the United States population now lives in coastal areas, including the shores of estuaries. In addition, coastal counties are growing three times faster than anywhere else. Unfortunately, this increasing concentration of people upsets the balance of the ecosystems. People need housing, services, and roads, so new industry and businesses arrive to provide them. All this stresses the estuaries by increasing the types and amounts of pollution entering them. When severe, such stresses have forced government authorities to close beaches and shellfish beds and issue warnings about eating fish. In addition, removing grass and trees for development can cause soil erosion and reduce natural habitat, which contributes to the threat of extinction of endangered wildlife."

* * * *

"PUGET SOUND:
Protecting the Sound from Contaminated Sediments

Sediments in Puget Sound are contaminated with toxic chemicals. This contamination results from large inputs of toxic substances to a body of water, which is a very serious problem in estuaries. Marine animals that live on the estuary floor can accumulate the poisons in their bodies and, sometimes, pass them on to humans who can eat them. To protect marine life and help guide decisions on when and where to clean up contaminated sediments, the Puget Sound NEP's CCMP called for development of the nation's first marine sediment standards. Because industrial and sewage plant dischargers are among the main sources of toxic substances entering the Sound, these sediment standards are being incorporated into their discharge permits. This should significantly reduce the quantity of poisonous substances entering the Sound."

This EPA document recognizes that contaminated sediments are a problem in Puget Sound, and that this contamination is a result of inputs of toxic substances. The RI/FS data clearly indicate that the Tulalip Landfill is a chronic source of contaminants to the surrounding environment. The landfill, by definition, is located within the Puget Sound estuary, and according to the RI/FS, all of the leachate discharges from the leachate discharges from the EPA concludes that leachate discharges from the landfill are contributing to the loading of contaminants in the Puget Sound estuary,**22** and the selected interim remedial action is necessary to contain these contaminants and prevent them from migrating into surface waters where they can interact with the environment. Clearly, there are other contaminant sources that are also contributing to contamination of the estuary. However, determining the relative contributions of various sources to the estuary is outside the scope of CERCLA, and addressing those sources of contamination are outside the scope of this response action. By implementing the selected alternative, contaminant loading to the estuary will be reduced.

2.14 Comment: "C.7. Region 10's Preferred Remedy is Inconsistent with Actions Taken at Similar Sites in Region 10 and Elsewhere." [3]

Response: EPA disagrees with this comment. The On-Source Area of the Tulalip Landfill is being managed and evaluated pursuant to EPA's presumptive remedy process. As noted in EPA's memorandum Presumptive Remedies and NCP Compliance, (EPA, 1995a)"(t)he use of presumptive remedies advances the NCP remedy-selection objectives in that the presumptive remedy initiative promotes consistency in decision making." The reader is referred to Responses to Comments 2.1.2. and 2.2 for more information regarding presumptive remedies and remedy selection. The nine remedy selection criteria in the NCP ensures the consistency noted in the above memorandum. The presumptive remedy process in general, and as used at the Tulalip Site, incorporates the nine NCP remedy selection criteria and provides additional consistency in decision-making.

22 Contaminant loading caused by Tulalip Landfill leachate discharges is contained in Table 5-14 of the Remedial Investigation Report.

The nine criteria were developed as a means to ensure consistency because the Agency understood that direct site-to-site comparison as a means of determining remedies was not feasible. The facts that form the basis for a remedy are unique to each site. There are a number of factors, in addition to the use of a presumptive remedy process, that make the comparison of the evaluation and decision making processes between sites inappropriate, such as: (1) the impact of state ARARs: (2) laws, regulations, and policies in place at the time of the remedial action; (3) the lead agency (federal or state) in charge of the cleanup action; (4) terms and conditions negotiated between the lead agency and the parties conducting the cleanup; and (5) unique site characteristics. Comparison of decisions and actions at sites has never been a requirement of the CERCLA remedy selection process because of the inherent variations that exist among sites.

Because the presumptive remedy process was used for the on-source area of the Tulalip Site and was not used at any of the sites noted by the commentor, comparison of risk evaluation processes (e.g., risk assessment approaches, remedy selection) is inappropriate. The streamlined risk assessment, as appropriate. The presumptive remedy process specifies the use of a streamlined risk assessment, as appropriate, for evaluating the need for remedial action at a site. The presumptive remedy process is a streamlined version of the full scale remedy investigation and implementation process used at the other sites. Consequently, differences between the evaluations exist.

EPA notes that EPA's selected interim remedy for the source area of the Tulalip Landfill, which includes a low permeability cover is, in general, consistent with remedies at the 30 sites EPA evaluated in developing the presumptive remedy approach and guidance. Of the 30 sites EPA examined, 24 sites, or 80% selected some type of low permeability cover as a remedy for the source area of the landfill. See OSWER Dir.No. 9355.0-49FS (EPA, 1993a). See also Responses to Comments 8.5 and 8.6.

2.15 Comment: "D. Application of EPA's Presumptive Remedy Guidance Does Not Require an Impermeable Cap for the Tulalip Landfill." [3]

Response: EPA agrees that the Presumptive Remedy guidance calls for containment of landfill wastes as the presumptive remedy for Municipal Landfill Sites. The guidance describes landfill caps as one possible component of the containment presumptive remedy. As such, EPA evaluated all of the components of the presumptive remedy of containment, including a capping alternative, when EPA made its remedial decision in the interim ROD. See also Response to Comment 8.1.

EPA has been receptive to non-capping alternatives suggested by the Respondents, and has done its best to evaluate these alternatives thoroughly. EPA's analysis of the alternatives in the ROD has led EPA to the conclusion that Alternative 4c is most likely to provide adequate protection at the most reasonable cost. None of the non-capping alternatives suggested by the Respondents provide a better balance of trade-offs the Alternative 4c. More specifically, there are many significant uncertainties associated with Alternatives (2b)(ii) regarding their potential protectiveness, implementability, and cost that are not exhibited by Alternative 4c.

2.16 Comment: "E. The Leachate Collection and Treatment Alternative (2b) is Preferable to the Geosynthetic Cover with Passive Drainage Alternative (4c) Based on the NCP's Remedy Selection Criteria." [3] [17]

Response: EPA evaluated eleven alternatives in the ROD, including Alternative 4c - Geosynthetic Cover with Passive Drainage; Alternative 2b - Leachate Collection with Treatment Berm; and Alternative 2b (ii) - Leachate Seep Collection with Discharge to POTW. EPA's analysis, provided in the ROD, shows that neither Alternative 2b nor 2b (ii) pass the two "threshold criteria" that must be met in order to further consider an alternative against the other seven NCP criteria. Appendix A to the ROD explains that even when evaluated against the NCP balancing criteria, Alternatives 2b and 2b (ii) compare poorly relative tot he selected Alternative 4c.

EPA concludes in the ROD that, based on EPA's analysis of all the alternatives that were considered, Alternative 4c provides the best balance of trade-offs among the alternatives with respect to the NCP remedy selection criteria. Of all the alternatives considered by EPA, Alternative 4c is the least expensive containment alternative that will effectively stem the generation and flow of contaminated leachate into the surface waters surrounding the landfill. EPA's analysis provides sound reasons why alternative 4c was selected and other alternatives were not.

EPA disagrees with the Respondent's analysis, and the Respondents' conclusions based on their analysis, which attempts to compare Alternative 2b (ii) with Alternative 4c with respect tot he nine NCP criteria (Golder, 1995b.) In EPA's view, the Respondents' analysis fails to fully and fairly describe the concerns with Alternative 2b (ii). More specifically, the Respondents' evaluation of Alternative 2b unjustifiably overestimates the potential effectiveness of this unproven alternative, disregards potentially serious problems with regard to its implementability, and, based on the considerable uncertainties that EPA perceives with respect to this alternative's unproven technologies, significantly underestimates the likely

cost of construction and operation and maintenance (O&M) of the proposed system.

EPA has been receptive to non-capping alternatives suggested by the Respondents, and has evaluated non-capping alternatives. Because EPA may end up implementing this interim containment remedy if an agreement cannot be reached that provides for the PRPs to do the work, it is in EPA's best interest, as well as the Respondents', to select an interim remedy that is most likely to provide adequate protection of human health and the environment at the most reasonable cost.

In EPA's view, it is not cost-effective to invest millions of dollars in constructing Alternative 2b and 2b(ii), unproven technologies that would not be protective, not comply with ARARs, might be implementable, and are more costly to operate and maintain than Alternative 4c, which employs proven containment technology with known effectiveness, implementability, reliability, is protective of human health and the environment, complies with ARARs, and has lower operations and maintenance costs.

EPA's careful and thorough analysis of the alternatives described in this ROD leads EPA to the conclusion that Alternative 4c is the most appropriate interim remedy. The other alternatives simply do not provide a better balance of trade-offs with regard to the nine NCP criteria than Alternative 4c. Based on EPA's analysis, EPA selected Alternative 4c as the interim remedial action, in accordance with CERCLA, the NCP, and EPA guidance.

2.17 Comment: "F. The United States Senate Has Directed EPA to Undertake Actions at the Tulalip Landfill which Require Region 10 to Withdraw the Proposed Plan Immediately." [2] [3] [8] [18]

Response: EPA disagrees with the conclusion of this comment. The language the commentor refers to is contained in the United States Senate Appropriations Committee Report that accompanied the HUD and Independent Agencies Fiscal Year 1996 Appropriations Bill. This funding bill has not been signed into law by President Clinton and therefore is not in effect.

EPA is currently conducting a comprehensive baseline risk assessment for the Site to support selection of a final remedial action at the Site. EPA expects the comprehensive baseline risk assessment may be completed in the summer of 1996. The comprehensive baseline risk assessment will be used to evaluate whether additional cleanup measures should be undertaken in the off-source areas to address contamination that has migrated to these areas from the landfill. A comprehensive baseline risk assessment is not necessary to develop early or interim alternatives for the source area of the landfill, nor would it allow development and evaluation of less expensive containment alternatives for the source area.

In addition, EPA notes that after the CERCLA statute is amended or an appropriations bill is signed into law, the Agency will review its requirements and make any appropriate changes in the way the Superfund program is being managed at all CERCLA sites, including the Tulalip Landfill Site. Also, the Agency at present cannot make any predictions regarding the EPA budget directives or anticipate what the final budget will be, how monies will be allocated for what actions, or what the provisions of a revised Superfund law will require. As such, EPA Region 10 believes it would be inappropriate to make changes to the Tulalip Landfill Site decision-making process until these legislative changes are codified into law. For the present, the Region is proceeding with this interim remedial action based on current laws, regulations, and policies.

2.18 Comment: Commentor stated that the Tulalip Site is being investigated under the NCP and it is therefore not appropriate to use additional concepts applied under other programs, such as pollution prevention, to address the site. [2]

Response: The commentor appears to be focusing his comment on the statement made by Mr. Brian O'Neal, a technical consultant for The Tulalip Tribes, at the October 3, 1995 public meeting on the Proposed Plan for the Tulalip Landfill site. In discussing the appropriateness of the placement of a cap on the landfill, Mr. O'Neal drew an "analogy between the use of the EPA's pollution prevention program" and the selection of the cap. Mr. O'Neal's comment did not state that the cap was selected because of EPA's pollution prevention goals. The fact that the implementation of a cap may result in minimization of leachate production, and this reduction of leachate is consistent with the philosophy of pollution prevention, does not mean that EPA's selection of the cap was driven by the pollution prevention program. Rather, EPA's selection of a cap at the Tulalip Landfill was governed by CERCLA, the NCP, and EPA guidance.

2.19 Comment: Commentor stated that it would be prudent and good public relations for EPA to back off of settlements at this time, especially in light of impending legislation focused at removing the Tulalip Landfill from NPL listing. (2]

Response: EPA presumes that the commentor is referring to the de minimis settlements since no other settlement offers are currently available. EPA believes that offering settlement opportunities to de minimis parties is entirely appropriate and consistent with current EPA policy. EPA is allowing these parties to obtain a complete release from liability at the Site at a very early stage in the process. With respect to

the portion of the comment regarding "impending legislation," EPA assumes that the commentor is referring to language in the United States Senate Appropriations Committee Report for the HUD and Independent Agencies Fiscal Year 1996 Appropriations Bill. The proposed report language would not require EPA to remove the Tulalip Landfill from the NPL, rather, the language directs EPA to conduct a comprehensive baseline risk assessment prior to selecting a final remedy. Despite the fact that the funding bill has not become law, EPA is proceeding at the Site in a manner consistent with this language. A comprehensive baseline risk assessment will be completed prior to the selection of a final remedy which addresses site-wide contamination. EPA is aware of no impending legislation focused on removing the Tulalip Landfill from the NPL.

EPA notes, for further clarification, that some Tulalip PRPs have initiated a lawsuit in federal court that challenges EPA's listing of the Site on the National Priorities List. EPA is unable to comment further on the lawsuit because this litigation is pending. See also Response to Comment 4.1.

2.20 Comment: Commentor stated that the AOC was intended only to cover the conduct of remedial investigation and feasibility studies and that it did not bind the respondents into performing remedial action at the site. [2]

Response: EPA agrees with this comment. However, EPA notes that the RI/FS AOC does not provide a release from liability for the signatories to the AOC. The PRPs who signed the AOC remain potentially liable for any future costs related to any response actions at the Site.

2.21 Comment: Commentor asked who would be expected to pay for the long-term maintenance associated with an FML-type cap if it were installed at the landfill. [2]

Response: EPA expects to include, as part of settlement terms reached with PRPs in the future, requirements for the long-term maintenance associated with the selected interim remedy. Pursuant to Section 107 of CERCLA, 42 U.S.C. § 9607, PRPs are liable for the response costs associated with the site clean-ups. The costs of long-term maintenance fall within the definition of response costs and are, therefore, the responsibility of the PRPs.

2.22 Comment: Commentor asked whether the EPA legally maintains authority over future development at the site given that the property is situated on the Tulalip Indian Reservation. [1]

Response: Pursuant to CERCLA, EPA has authority to take response actions to protect public health or welfare or the environment. Consistent with this authority, EPA has selected a remedy which addresses potential or existing threats associated with the landfill located on the reservation. EPA's selected remedy may have an impact on future land development at the Site. As part of the remedial action, EPA will require institutional controls which will protect the integrity of the implemented remedy. EPA and the Tribe will develop a plan for "routine" future uses of the Site. This plan will also protect the remedy. See ROD Section 10.0 - Selected Remedy, for more information about institutional controls. See also Response to Comment 2.7.2.

2.23 Comment: Commentor asked if off-site wetlands that revealed contamination similar to what was found at the landfill would also become the responsibility of the PRPs. [1]

Response: The PRPs are potentially responsible for contamination at the Site. The extent of contamination at the Site includes the contaminant source area (i.e., the 147-acre landfill area, including the perimeter landfill berm), and any off-source areas that have been contaminated by discharges from the source area. Such contaminated off-source areas are part of the Site. The Site-wide FS, which has not yet been completed, will evaluate alternatives, including a "no-action" alternative, for cleaning up any contaminated off-source areas.

2.24 Comment: Commentor asked for clarification in meaning between the "Interim Cleanup Action" and the "Final Cleanup Action." [1]

Response: The interim cleanup action is an early, interim remedial action that EPA believes must be implemented at this time to contain the waste at the Site in order to protect human health and the environment. EPA expects that this interim remedial action will minimize the migration of contaminants from the source area to off-source wetlands, sloughs, and tidal channels. If, after construction of the selected interim remedial action (Alternative 4c) is completed, EPA determines, based on Site data, that Alternative 4c is not effectively containing the landfill wastes, additional containment action(s) for the source area, such as a perimeter leachate collection and treatment system, may be necessary. If such additional measures are necessary, they will be documented in the final ROD for the Tulalip Site, which will address any additional measures for the source area, as well as any remedial actions that may be necessary for the off-source areas of the site (such as cleanup measures for the off-source wetlands, if necessary). For additional information, see interim ROD Section 4 - Scope and Role of Interim Response Action.

2.25 Comment: Commentor states that EPA's Presumptive Remedy Guidance assumes institutional controls will be necessary to restrict future activities at CERCLA municipal landfills in order to maintain the integrity of the containment system. The commentor states that EPA has ignored this fact by using the off-source media to justify a remedy that can only be applied to on-source media. [3]

Response: The commentor is inappropriately linking concepts that are not related in the way the commentor suggests. EPA agrees that the Presumptive Remedy Guidance states that institutional controls are appropriate to restrict future activities at CERCLA municipal landfills in order to maintain the integrity of the containment system. For example, an appropriate institutional control might be a prohibition on excavating holes through a landfill cover system, because holes would obviously reduce the effectiveness of the cover. However, such institutional controls have nothing to do with EPA's consideration of off-site data in the context of selecting a containment remedy for the-source area.

It is entirely appropriate to consider off-site data (along with on-source data) when evaluating the potential need for an interim containment action at landfill sites because the basic goal of a containment action is to contain the landfill wastes, thereby reducing impacts of contaminants migrating from the source area to the off-source area. For this reason, in EPA's view, it would be difficult to make a sound decision on whether containment of a source area is needed in the absence of any off-source data. In fact, EPA's review of the RI data indicates that, at this time, the landfill wastes are not adequately contained; the RI data shows that the landfill is acting as a contaminant source, and contaminants are migrating from the landfill to off-source areas. The Streamlined Risk Assessment included an evaluation of off-source data to comparison numbers that are considered to be protective of human health and the environment, and found many exceedances of the comparison numbers, which indicated that the landfill poses a potential threat to the surrounding areas. A containment remedy would contain these contaminants and prevent on-source contaminants from moving to off-source areas, thereby reducing potential risks to humans and ecological receptors. if the off-source data had showed no exceedances of the comparison numbers (which is not the case), EPA may have concluded that the landfill is not acting as a contaminant source to off-source areas. **23**

EPA is unclear as to the meaning of the commentor's reference to institutional controls as related to the off-source area. Consideration of off-source data during the interim remedy selection process is unrelated to the issue of institutional controls which, in the case of a solid waste landfill cover, are usually identified along with the selected remedy in the ROD to protect the integrity of the cover system after it is installed.

2.26 Comment: Commentor stated for the public record that the Seattle Disposal Company (SDC) previously requested an emergency injunctive motion for relief from the 9th Circuit and argued at the time that irreparable and immediate threat was present at the site. Commentor went on to state that now that the SDC is considered a viable PRP, they argue that risks at the site need to be evaluated before a remedy is selected, if a remedy is warranted at all. [2]

Response: Comment noted.

2.27 Comment: EPA's proposed remedy is not mandated by other environmental laws or standards and goes well beyond the "threshold criteria" of the NCP. [3]

Response: It is EPA's responsibility to fulfill the statutory mandates of all federal laws under its jurisdiction. CERCLA is just one of many laws which authorize EPA to respond to environmental problems. Since CERCLA and the NCP specifically govern response actions at sites where there has been a release-or threatened release of hazardous substances which may present imminent and substantial endangerment to public health or the environment, EPA is required to select a remedy which is consistent with the requirements set forth in CERCLA and the NCP, regardless of whether the remedy chosen is "mandated" by other environmental laws or standards. Although other laws and regulations may be ARARs at the Site, and therefore may be considered in selecting a remedy, only CERCLA specifically governs the selection of response actions at CERCLA sites. EPA believes it has conducted a thorough evaluation of alternatives through the use of the nine NCP criteria. EPA is confident that the remedy it has selected is the most appropriate to remediate the source area of the Site, and directs the commentor to ROD Section 9.0 - Summary of the Comparative Analysis of Alternatives, for further information regarding EPA's evaluation.

23 on-source data must also be considered, because another purpose of a containment remedy is to prevent direct exposure to landfill contents.

3.0 PRE-CERCLA CLOSURE HISTORY

3.1 Comment: Commentor asked if EPA approved the closure of the Tulalip Landfill in 1979 and 1980 after the cover was placed. [2]

Response: At the insistence of EPA, the landfill was closed and capped in 1979 pursuant to the Rivers and Harbors Act of 1899, 33 U.S.C. §§ 403,407 and the Clean Water Act, 33 U.S.C. §§ 1311, 1319, 1342, and 1344. The closure-and capping was performed in accordance with a consent decree, which was executed by EPA, Seattle Disposal Company and the Tulalip Tribes and entered in the U.S. District Court for the Western District of Washington. However, the filling and initial capping of the landfill as provided in the consent decree, while completed and approved in 1979, failed to halt the discharge of contaminated leachate from the landfill. As a result, further remediation of the landfill is necessary at this time. The current PRPs at the Site did not receive a complete release from future liability at the Site through the 1979 consent decree, therefore they are still responsible for the response costs under CERCLA to address ongoing problems at the Site.

3.2 Comment: Commentor asked why, if the original closure and containment of the landfill was accepted in 1979, PRPs are now being asked to address problems at the site. [1] [12]

Response: The PRPs are being asked to address problems at the Site because the original closure and containment of the landfill did not successfully eliminate the production and discharge of hazardous substances from the Landfill into the environment.

3.3 Comment: Commentor indicated that EPA had required Marine Disposal to cover the landfill with two feet of clean fill and that EPA had inspected and accepted the completed cover. The commentor indicated that EPA should honor its release and that pre-1979 parties should have no further liability. [2]

Response: Marine Disposal was required to comply with all existing regulations governing the capping of a landfill. Included in those requirements were the state MFS which, consistent with technical knowledge of capping technology at the time, dictated placing two feet of clean fill on the landfill as part of the capping effort. CERCLA is a strict liability statute which means that a person can be held liable for costs of cleanup regardless of fault. Despite efforts to cover the Site in 1979, which were consistent with current laws and regulations at that time, the cap installed at the time was ineffectual in remediating the contaminant problem at the Site. No PRPs were given a complete release from liability under the Consent Decree for their contribution to the remediation of the Site at that time. Thus, Marine Disposal Company remains liable for the costs of remediating the Site according to current laws and regulations.

3.4 Comment: Commentor indicated that the Tulalip Tribes, with the permission of EPA, reopened the landfill in 1986 to accept demolition debris and in doing so, disturbed the cover. The commentor stated that the Tulalip Tribes should continue to develop the site as originally intended that it is not EPA's responsibility to continue this development or compensate the Tulalip Tribes for loss of natural resource land which the Tulalip Tribes elected to fill. [2]

Response: EPA's responsibility is to respond to the release of hazardous substances into the environment. Leachate containing hazardous substances continues to be generated and released from the landfill. EPA has the authority under CERCLA to require any persons who are defined as potentially liable parties under Section 107 of CERCLA, 42 U.S.C. 9607, to pay for the costs of responding to that release. Additionally, EPA has no evidence that the acceptance of demolition debris for the purpose of building roads on the landfill as part of a capping effort to address ongoing leachate discharges disturbed the cover of the landfill.

3.5 Comment: Commentor asked why EPA, if they are concerned with remediating leachate discharges under Superfund, allowed the Tulalip tribes to violate their NPDES permit since at least 1986. Also EPA allowed toxic dumping to be done after the site was legally closed. [2] [8]

Response: As stated in Response to Comment 2.8.1., EPA's obligation to take enforcement action for violation of NPDES permits is wholly discretionary. EPA has determined at this time that the appropriate means of addressing the leachate problem at the Site is not through enforcement of the NPDES permit, but rather, through the remedy selection process under CERCLA. Under CERCLA, EPA can require extensive study of the Site and can evaluate a number of alternatives for remediation of the Site so that it can choose a response action which most comprehensively and effectively addressees the contamination.

EPA did not allow toxic dumping to be done after the Site was legally closed. In 1986, the Tribes applied for an NPDES permit solely for the purpose of placing additional capping material on the landfill to correct the previous inadequate closure of the landfill. The original permit allowed the Tribes to obtain low permeability soil from a freeway construction project near Seattle. However, the soil did not become available and EPA modified the NPDES permit in 1987 to allow placement of capping materials from other sources. The permit contained provisions which required the sources of capping material to be screened for

hazardous substances prior to their placement on the landfill. Due to problems in obtaining adequate types and amounts of capping material, only a small actually placed at the Site. The Tribe's limited capping activities at the Site from 1987-1990 resulted primarily in construction of a grid of roadways rather than the corrective capping envisioned. EPA is not aware of any information which indicates that any hazardous substances have been transported to the Site since 1979.

4.0 NPL LISTING

4.1 Comment: Commentor suggested that the rationale employed in classifying the site as a Superfund site was flawed and required further explanation. [1]

Response: On April 25, 1995, EPA promulgated a final rule adding the Tulalip Landfill site to the National Priorities List (NPL) (60 Fed. Reg. 20330). The site had been proposed for inclusion on the NPL on July 29, 1991 (56 Fed. Reg. 35840). The rationale employed in classifying the site as a Superfund site is based on the criteria in the Hazard Ranking System (HRS) established by the National Contingency Plan, 40 C.F.R., Part 300 under Section 105(a)(8)(B) of CERCLA, as amended.

EPA received few comments on the proposal during the 60 day public comment period. However, voluminous late comments were received by EPA from some of the PRPS well after the close of the comment period. EPA carefully evaluated all comments received prior to the final listing decision and specifically responded to the claim by some commentors that its rationale was "flawed". This response can be found in the Support Document for the Revised National Priorities List Final Rule-April 1995 (EPA, 1995b).

EPA has followed all of the Administrative Procedures Act requirements that govern this informal rule-making as well as the specific criteria for listing a site on the NPL established by regulation.

5.0 TRIBES ROLE

5.1 Comment: Commentor asked what settlement amount is being offered to the Tulalip tribe as their portion of the responsibility for the site contamination, and what things they are being required to do to take care of the cleanup. [2]

Response: The Tulalip Section 17 Corporation **24**, U.S. Bureau of Indian Affairs, generators, transporters, and users of the site currently participating in a cost allocation process. The purpose of this process is to determine the fair share of response costs that each of the parties should pay. EPA intends to discuss settlement terms with parties after the conclusion of the allocation process.

5.2 Comment: The commentor stated that the Tribes should have to pay for the entire cleanup. They were paid for use of the landfill. Tribe caused the problem. [9] [15] [17]

Response: Pursuant to CERCLA, owners and operators of the Site as well as generators and transporters of hazardous substances found at a Superfund Site are liable for cleanup costs associated with a site.

Therefore, other parties in addition to the Tulalip Section 17 Corporation, are responsible for response costs incurred at the Site.

5.3 Comment: Commentor asked if the participation of the Tulalip Tribes' representatives at the October 3 public meeting was funded by EPA under a specific cooperative arrangement. [2]

Response: The Tribes' participation, including Tribal members, the Tribes' Superfund Coordinator and technical consultants, at the Public meetings held by EPA on August 22, 1995 and October 2, 1995 was not funded by EPA. However, EPA notes that, to assist the Tribes' involvement in the Superfund process, EPA entered in to a Memorandum of Agreement (MOA) with the Tribes on February 11, 1992. The MOA was amended on September 9, 1992 to include the Bureau of Indian Affairs as a signatory. EPA also granted the Tribes a Superfund support agency cooperative agreement under Section 104 of CERCLA, which continues to provide funds for the Tribes' Superfund coordinator.

24 The Tulalip Section 17 Corporation leased the Site to the Seattle Disposal Company for landfill operations and was also involved in post-1980 capping activities at the Site.

6.0 ARARS

6.1 Comment: Commentor asked for an explanation of how EPA could consider MFS as ARARs for this site and what efforts EPA has made to determine how Department of Ecology has applied current MFS to landfills that were closed before those standards were adopted. [2]

Response: See the Responses to Comments 2.12., 2.12.1, 2.12.2, 2.12.3 and 2.12.4 regarding the applicability of MFS as an ARAR for the Tulalip site.

EPA, in accordance with the EPA/Ecology Memorandum of Understanding of August 18, 1994 **25**, has provided Ecology with periodic updates regarding past and projected activities at the Tulalip site.

According to Mr. Pete Kmet26, Senior Environmental Engineer, Toxics Cleanup Program, Washington Department of Ecology, the current MFS are required at all solid waste landfills requiring remedial action under MTCA, regardless of the date that the landfill was closed. WAC-173-340-710 (6) (c) states:

> "Solid waste landfill closure requirement. For solid waste landfills, the solid waste closure requirements in chapter 173-304 WAC shall be minimum requirements for cleanup actions conducted under this chapter. In addition, when the department determines that the closure requirements in chapter 173-303 WAC are applicable requirements, the more stringent closure requirements under that law shall also apply to cleanup actions conducted under this chapter."

25 Environmental Protection Agency, Region 10, Washington State Department of Ecology, Superfund management in Washington, August 18, 1994 describes the role EPA and Ecology will play at each NPL site in the State of Washington.

7.0 HR 2099

7.1 Comment: Commentor asked EPA if it plans to follow the direction of the Senate and if it plans to undertake an alternative dispute resolution process which involves a neutral party. The commentor also indicated that the public meeting directed by a neutral facilitator does not constitute a neutral party dispute resolution process as defined by the U.S. Senate. [2]

Response: EPA will address any pending legislation when it becomes final. See Responses to Comments 2.6 and 2.17.

8.0 CONSISTENCY WITH OTHER SITES

8.1 Comment: Commentor stated that they did not believe that the presumptive remedy was synonymous with an impervious cap, and that of 30 sites which went into a documented presumptive remedy, only 24 had low permeability caps. [2]

Response: EPA agrees that the presumptive remedy is not "synonymous" with an impervious cap and that the presumptive remedy specifies containment as the presumptive remedy for municipal landfills. For further details, see the Response to Comments 2.7.1 and 2.15. According to EPA's Guidance "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA, 1993a) components of containment include features such as a cap, groundwater controls, leachate collection and treatment, gas collection and treatment, etc.

EPA also agrees that 24 of the 30 or 80% of the sites studied as background for the presumptive remedy had an low permeability cap. EPA notes that all 30 sites either already had a cover, or the ROD called for repairs of an existing cover, or the ROD called for construction of a new cover.

In EPA's memorandum "Presumptive Remedies and NCP Compliance" (EPA, 1995a) the Agency notes that flexibility is also needed to take into account unique site characteristics. EPA agrees that the presumptive remedy does not dictate a cover and based on EPA's experience other alternatives are sometimes selected. Unique site characteristics can lead the Agency to select different remedies at seemingly similar sites.

> **26** Personal communication by Lynda Priddy on February 15, 1996. Mr. Kmet cited WAC 173-340-710 (6)(c) as applicable to all solid waste landfills, regardless of the landfill closure data (if any), determined to require a remedial action pursuant to MTCA.

The reason Alternative 4c, which is a geosynthetic cap, has been chosen for the Tulalip Site is that Alternative 4c satisfies all of the NCP remedy selection criteria EPA uses to evaluate remedial alternatives. Other remedial alternatives, some of which include only a leachate collection system without a cap, were also evaluated according to the same NCP criteria and failed to satisfy EPA's remedy selection criteria. For more information about the remedy selection process and evaluation used for remedial alternatives, see the

Response to Comment 1.1, and ROD Section 9.0 - Summary of the Comparative Analysis of Alternatives. See also the Response to Comment 2.7.1 (Highlight 1) for more information about the components of a containment remedy.

8.2 Comment: The commentor has been unable to identify a single closed landfill required to be remedied to meet MFS. [3]

Response: See Responses for Comments 2.12, 2.12.1-2.12.4, 6.1, and 8.1.

8.3 Comment: Commentor stated that the Tulalip Landfill was evaluated differently than five other CERCLA landfills (Old City of York, Whidbey Island NAS, OU 2/3, Whidbey Island NAS, OU 4/5, Hamilton Island Landfill and Everett Landfill). The processes used in evaluating the other landfills, but not used for the Tulalip Landfill, include: (1) screening level assessments were conducted to screen out chemicals and media of potential concern; (2) baseline risk assessments were conducted (except where the screening assessments identified negligible risk); (3) background concentrations of all media were evaluated; (4) screening values were appropriately applied; (5) site data were appropriately used; and (6) remedial impacts were completely evaluated. [3]

Response: See Responses to Comments 2.41 and 2.14.

8.4 Comment: Commentor suggested the EPA's cleanup approach at the landfill was not consistent with other remedy selections at other federal facilities within Region 10. [1]

Response: EPA cannot respond specifically to the comment because the Agency is not sure what the commentor means by "other federal facilities". See Responses to Comments 2.4.1 and 2.14 for responses to other similar comments regarding consistency with other sites.

8.5 Comment: Commentor asked if EPA or its consultant, Weston, had reviewed or evaluated the RODs for the Whidbey Island, Hamilton Island, and Columbia River landfills prior to issuing the Proposed Plan on August 4, 1995. [2]

Response: CERCLA and the NCP require that EPA base its remedy selection on the weighing of nine NCP criteria, not on the evaluation of RODs from other similar sites. Consequently, EPA did not specifically evaluate each ROD for the above-mentioned sites before EPA issued the Proposed Plan for the Tulalip site. Instead, EPA followed the Presumptive Remedy process for abbreviating the RI/FS and remedy selection processes.

The basis of the Presumptive Remedy Guidance is an evaluation of the process and decisions at 30 similar landfills. EPA's Presumptive Remedy Guidance identified those alternatives that satisfy the nine NCP criteria. EPA maintains consistency by following not only CERCLA and the NCP but also appropriate Agency guidance and policies.

In preparing for the Responsiveness Summary, EPA has examined the RODs for the two operable units at Whidbey Island NAS OUs 2 and 4 and Hamilton Island. (EPA does not know what the commentor means by "Columbia River Landfills" and therefore can not respond to that part of the comment). EPA has determined that the investigation and evaluation processes for these sites differed from the Tulalip Site because these sites did not follow the presumptive remedy process. The Whidbey Island OUs and the Hamilton Island Site were construction debris landfills, whereas the Tulalip Site was a commercial/industrial landfill where hazardous substances were disposed. Construction debris landfills are not similar in terms of risk concerns to municipal landfills or commercial/industrial landfills.

Additionally, based on early RI data gathered at the Hamilton Island Site, it became clear to the Agency that remedial action at the Site may not be necessary. However, to fully substantiate a no remedial action determination for Hamilton Island, EPA conducted a comprehensive baseline risk assessment. In contrast, at the Tulalip Site, where RI data indicated the possible need for remedial action, a streamlined baseline risk assessment was sufficient to support the need for remedial action. Also, Tulalip Landfill, unlike the Whidbey Island Ous and the Hamilton Island Site, was sufficiently similar to municipal landfill sites that utilizing the presumptive remedy process at Tulalip was appropriate. See Responses to Comments 1.1, 2.1, 2.4.1 and 2.14 for more details.

8.6 Comment: Commentor indicated that remedial activities at Whidbey Island (EPA assumes the commentor means Ous 2 and 4 as in other comments made by the commentor), Hamilton Island, and Columbia River did not involve and impermeable cap. The majority of these landfills used a "comprehensive baseline risk assessment."Additionally, frequency of detection and background data were taken into account in the "baseline risk assessments." [2]

Response: As explained in the Responses to Comments 2.4.1 and 2.14, these sites did not follow the presumptive remedy process and therefore these sites are not comparable to Tulalip Landfill, for which EPA

and the Respondents agreed the presumptive remedy approach was appropriate. Under the presumptive remedy process which EPA followed for the Tulalip Site, a streamlined baseline risk assessment is sufficient to justify and interim remedial action. EPA does not know what the commentor means by the "Columbia River" site.

8.7 Comment: Commentor indicated that the Tulalip Landfill shares few similarities to landfills located at Whidbey and Hamilton Islands and that drawing comparisons between these landfills is inappropriate. [2]

Response: EPA agrees that these sites are not similar to the Tulalip Landfill and are not good examples to use in comparing investigation and evaluation processes. See Response to Comment 2.4.1 and 2.14.

9.0 HYDROGEOLOGICAL ISSUES

9.1 Comment: Commentors asked if lateral or tidally influenced flow of groundwater is present through on-site waste and if groundwater flow beneath the site would continue to be effected by existing wastes at the site even after surface infiltration of rain water was eliminated. If so, the commentors asked how the current recommended action would prevent horizontal contaminated groundwater flow from influencing Zone 1 and Zone 2 groundwater. [1] [4]

Response: EPA expects that installation of a cap on the landfill will significantly reduce the downward and horizontal movement of contaminated groundwater by reducing rainfall as a source of groundwater recharge. Groundwater modeling suggests that Alternative 4c is expected to reduce the average infiltration of rainfall by more than 99 percent. Rainfall is the primary source of groundwater in the refuse layer (Zone 1) at the Tulalip Landfill. Rainfall also provides the primary driving force for groundwater discharging to the seeps and recharging to deeper layer beneath the refuse (Zone 2). Currently, the water level in the landfill is generally higher than the water level in the surrounding sloughs. Groundwater tends to flow from areas with higher water levels to areas with lower water levels. Groundwater in Zones 1 and 2 is currently flowing radially away from the center of the landfill towards the sloughs. During the summer months when little rainfall occurs and the water level in the refuse layer is lower, the number of seeps decreases; during the winter months when abundant rainfall occurs and the water level in the refuse layer is higher, a greater number of seeps are found. Installing a cap on the landfill is expected to eliminate the downward and lateral movement of groundwater through the refuse and the formation of seeps by cutting off rainfall as the source of groundwater recharge. As a result, most waste will no longer be saturated or subject to infiltration by rainwater.

EPA believes that groundwater in the refuse layer (Zone 1) is not significantly (if at all) impacted by tidal fluctuations, based on EPA's review of the results of a 72-hour tidal study conducted by the PRPs and described in the Remedial Investigation report (HLA, 1995, Section 3.6). Water levels in Zone 1 monitoring wells are several feet higher than the high tide levels in the surrounding sloughs.

A relatively small amount of the refuse is located within the Zone 2 interval below the landfill (i.e., within the former barge canals). Regional groundwater flow is expected to resume within Zone 2 once the groundwater mound in Zones 1 and 2, caused by infiltration of rainfall into the landfill, is reduced or eliminated by Alternative 4c. EPA expects that the rate of migration of contaminants in Zone 2 to the sloughs will be significantly reduced due to the lower groundwater flow velocities anticipated under the regional groundwater flow gradient and because of the reduced volume of waste available for leaching.

9.2 Comment: Commentor asked how much leachate is presently discharging from the site and how much leachate was expected to discharge with the implementation of Alternative 4c. [1]

Response: Leachate currently discharges through leachate seeps in the perimeter landfill berms onto wetlands surrounding the Site, and down into the Zone 2 aquifer and then into the sloughs. Construction of the Alternative 4c landfill cap is expected to reduce the total leachate discharges from the landfill from approximately 130 gallons per minute (gpm) to less than 0.4 gpm (Golder, 1995a, Table 3-2); this represents a reduction of more than 99 percent. Discharges of leachate through the seeps is expected to be eliminated in approximately 2 years.

Based on field observations and estimates from the groundwater modeling developed by the AOC Respondents and summarized in the RI Report (HLA, 1995, Section 3.4) and the FS Report (Golder Associates, 1995a, Section 1.2.4), between 6 and 45 gpm currently discharge from the surface seeps. Discharge is higher during rainy months and lower during relatively dry summer months. Leachate seeps represent about 5 percent to 35 percent of the total groundwater discharge from the refuse layer. According to groundwater modeling estimates, 65 percent to 95 percent (43 to 82 gpm) of the leachate currently discharges into the Zone 2 sand layer beneath the landfill.

Approximately 2 years following construction of the Alternative 4c cap, any leachate present under the cap is

expected to move into the underlying Zone 2 layer. The surface seeps would be eliminated due to the lowering of the groundwater level within the refuse layer to an elevation below that of the seep locations. The amount of leachate discharging to Zone 2 is expected to drop rapidly for the first couple of years following construction of the cap and then decrease more gradually to nearly zero within a decade. For other alternatives such as the various leachate interception proposals (e.g., Alternatives 2b and 2b [ii]) the amount of leachate discharging to Zone 2 will drop rapidly over the first year following construction, but will then fluctuate widely between less than 1 gpm to 50 gpm due to seasonal variation in rainfall infiltration (Golder Associates, October 1995b, Figure 4-1). This is based on the assumption that the leachate interception system will operate at 100% efficiency, which is unlikely. If the leachate interception system operates at less than 100% efficiency, due to fouling or plugging, then the discharge to Zone 2 would increase. The seasonal variation in leachate discharge predicted for the leachate interception alternatives results from the lack of an impermeable cap that would prevent the generation of leachate during the rainy seasons.

10.0 DATA QUALITY/DATA EVALUATION OF 1988 SITE DATA

10.0 Comment: Commentor expressed the opinion that Tulalip Landfill EPA Case 8956 **27** data are questionable and should not be relied upon for quantitative purposes. Specifically, their findings call into question all data produced by CompuChem for Case 8956 and reportedly provide evidence of flaws in data produced by Rocky Mountain Analytical Laboratories (RMAL) for Case 8956. Commentor indicated that the contents of several documents support their argument. These documents include: correspondence from EPA's Office of Inspector General and associated memoranda concerning the Investigation Referral Contract Lab Program; an internal EPA investigative report of the agency's Environmental Monitoring Systems Laboratory (EMSL); telephone logs; data validation checklists and data assessments; and excerpts from deposition transcripts from an EPA employee and CompuChem employees. [3]

27 EPA Case 8956 refers to the sample group number for the 1988 surface soil and water data for the source area of the Tulalip Landfill.

Commentor suggested that CompuChem's data should be disqualified due to the laboratory's possible failure of performance evaluation (PE) samples and its failure to comply with established EPA procedures. Commentor asserted that the results of the quarterly blind PE samples analyzed between October 1987 to May 1988 should be obtained and evaluated. [3]

Further, because the commentor was not provided with any telephone logs documenting dialogue between EPA, CompuChem, or RMAL, the commentor suggested that participating laboratories failed to inform EPA of problems as they arose (e.g., a broken sample container and a lost sample). Commentor indicated that this represents a direct conflict with the 7/87 and 10/86 CLP SOW. [3]

Response: Regarding the reliability of the data from Case 8956, EPA has re-reviewed the data and made a determination that the data is reliable for its use in the Streamlined Risk Assessment. This review can be found in the Support Document for the Placement of the Tulalip Landfill on the National Priorities List (EPA, 1995b). In instances where qualified data were used by EPA, the potential bias associated with the qualified data relative to human health or ecological based levels of concern was considered. One such example would be the use of contaminant data that is above human health or ecological based levels and has an associated data qualifier describing its value as being potentially biased low (meaning that the true concentration of the contaminant may be higher).

Regarding CompuChem's performance in analyzing PE samples, EPA has reviewed the PE samples that were relevant to Case 8956 (QB2 and QB3 were analyzed before and after samples for this Case) and found a very slight exceedance of the acceptable limit for benzene in QB2 and a low bias reporting the phenol compounds in QB3. With these results, in addition to all quality control data for Case 8956, EPA finds no valid reason to disqualify CompuChem's data for Case 8956.

Regarding the absence of telephone logs between EPA, CompuChem or RMAL, concerning a broken sample container and a lost sample, shipment or discrepancies in the documentation are resolved with the Sample Management Office (SMO) and noted in the comments section of the "Contents for Gray Envelope". The Gray Envelope may not be found with the sample batches for the Tulalip Landfill; however, this information is redundant because the Field Sample Data and Chain-of-Custody form and the Organic Sample Traffic Report form would also record receipt of the samples by the laboratory. (For further details see Woods, 1996 in the AR for the interim ROD.)

10.2 Comment: Commentor concluded that one or more flaws exist with the EPA Case 8956 data. In summary, it is the opinion of the commentor that the data is considered flawed and not reliable for quantitative use because of (i) the high percentage of qualified data; (ii) the omissions and errors of participating laboratories and field sampling personnel to comply with established procedures required by EPA; and (iii)

the inability of EPA to provide the complete file purge documentation for CompuChem or RMAL which is necessary to verify that all laboratory procedures were followed. [3]

Response: See Response to Comment 9.1. In addition, in its review of the documentation, EPA could find no significant deviations from procedures by participating laboratories or field contractors that would warrant rejecting any of the data from Case 8956 that has been used. For more specific information, see the Support Document for the placement of the Tulalip Landfill on the National Priorities List (EPA, 1995b).

Regarding complete file purge documentation, EPA agrees that two documents may be missing for some of the data. However, the information in these documents is redundant and can be obtained from information in other documents that are part of the sample data package. For further details see Woods, 1996 in the AR for the interim ROD.)

10.3 Comment: Commentor states that many errors were committed by (i) the EPA contractor (i.e., Ecology & Environment, Inc.) in sample documentation, (ii) the EPA in copying the original data, and (iii) the contract laboratories in reporting data. These errors are summarized below. [3]

- Chain-of-custody (COC) records for organic data were broken.
- No COC for copies were observed with signatures and data and time of sample receipt by laboratory.
- The COC forms for both inorganic and organic samples did not document if container custody seals were intact.
- The sample descriptions from the inorganic laboratory data indicated that many of the water samples were collected improperly (i.e., some of the samples were described as cloudy, thus suggesting that particulates from the sediment were introduced into the sample at the time of collection).
- The complete "case file purge" for both organics and inorganics was not available. This should have included (i) the worksheets necessary to verify the percent moisture content of the organic sediment sample data; (ii) sample tags and sample tracking records within the laboratory; and (iii) documentation describing the condition of sample bottles upon receipt (e.g., temperature).

Response: With regard to missing Chain-of-Custody (COC) forms or COC forms without signatures and dates of receipt by the laboratory and verification of sample condition, EPA has addressed these deficiencies along with the available redundant information found in the signed Traffic Reports from the labs. This information can be found in the Support Document for the Placement of the Tulalip Landfill on the National Priorities List (EPA, 1995b).

Regarding the worksheets for verifying percent moisture content of the organic sediment data, additional verification of percent moisture data can be acquired from the inorganic data packages since both the inorganic and organic laboratories perform this same determination on split samples.

Regarding sample tracking records within the laboratory, EPA has reviewed the previously identified audit reports for these labs and has found that sufficient sample tracking procedures were in place at the time that Case 8956 samples were within these facilities. (For further details see Woods, 1996 in the AR for the interim ROD).

Regarding the confirmation of sample temperature upon receipt, EPA believes that elevated sample temperatures would have resulted in an overall low bias for some organic compounds and possibly mercury results. For sample results that were measured above Human Health or Ecological based levels of concern, EPA believes the data to be suitable for its intended use.

10.4 Comment: Commentor stated that neither the EPA's Support Document (April 1995) for the placement of the Tulalip Landfill on the National Priorities List nor the additional documents provided to the PRPs alleviate these concerns. [3]

The commentor questioned the reliability of the RMAL and CompuChem generated data based on the laboratories (i) non-compliance with the contract laboratory program statement of work (SOW) requirements for sample tracking procedures; (ii) analysis of samples by staff lacking documented credentials; (iii) RMAL's lack of standard operating procedures (SOPs); and (iv) CompuChem's failing scores on the performance evaluation samples. [3]

Response: Regarding PE scores, see Response to Comment

9.1. EPA has reviewed the commentor's concerns regarding alleged non-compliance with CLP SOW requirements for sample tracking, credentials of laboratory staff and status of RMAL's SOPs. Upon reviewing audit reports and available documentation, EPA believes that the commentor's expectations of the level of detail contained in internal tracking documents are much higher than what EPA expected or required of the laboratories under contract. At the time samples for Case 8956 were within the laboratories, these facilities met the requirements of the CLP SOW for internal sample tracking. (For further details see Woods, 1996 in the AR for the interim ROD).

Regarding the status of RMAL's SOPs, audit reports of RMAL cite the absence of SOPs. This occurrence makes reference to an instance where the agency had not forwarded the SOPs to the contract auditor in time for the audit. (For further details see Woods, 1996 in the AR for the interim ROD).

Regarding laboratory staff credentials, EPA acknowledges that the Routine On-site Audit Reports and Data Package Audit Reports state that staff resumes have not been submitted to the Agency (a contract requirement at the time). However, during the on-site audits, the auditors did make a determination that the personnel performing specific job duties met the required educational and experience requirements, despite the fact that they did not have the required resumes on file with the Agency. (For further details see Woods, 1996 in the AR for the interim ROD).

11.0 STREAMLINED BASELINE RISK ASSESSMENT FOR INTERIM REMEDIAL ACTION

General Comments

11.1 Comment: The commentor agrees with the Risk Assessment findings and believes the assessment is a valid basis to proceed with the interim remedy. The commentor also supports the time line for implementing the remedy and opposes the extension of the public comment period because it interferes with the timely remediation of the site. [10]

Response: In response to the extension requests from PRPs, EPA agreed twice to extensions of the public comment period from 30 days to a total of 80 days. This 80-day comment period for the Proposed Plan was 50 days longer that the maximum defined by the NCP. EPA does not believe the extension will significantly delay the construction and operation of the remedy. However, EPA denied a subsequent request for an additional extension of the comment period because EPA believes 80 days is sufficient time to comment. Also, the Agency has not developed responses to comments submitted to EPA after the close of the comment period for inclusion in the Responsiveness Summary unless information submitted with the late comments would significantly alter the response action at the site.

11.2 Comment: The commentor claims that the Risk Assessment was manipulated to support a predetermined remedy, namely 4c, and that The Tulalip Tribes have wanted this area to be filled for commercial development since the early 1960s. [8]

Response: The Streamlined Risk Assessment, as explained in earlier responses (see Responses to Comments 1.1, 2.1 and 2.7.1), was a streamlined baseline risk assessment that satisfies all the pertinent requirements of CERCLA, the NCP, and EPA's presumptive remedy and risk assessment guidance. The interim containment remedy selected by EPA for the Tulalip Landfill source area falls within the scope of a presumptive remedy. Additionally, when selecting a remedy, EPA must follow a prescribed procedure that involves an evaluation of the alternatives under consideration against evaluation criteria set forth in the NCP. EPA has completed this process of evaluation and has determined the Alternative 4c is the most appropriate remedy for the Site. It was only after the completion of the Streamlined Risk Assessment and the evaluation of the alternatives that EPA determined Alternative 4c to be appropriate. The rationale for selecting Alternative 4c is documented for public comment in the Proposed Plan and interim ROD. Based on this evaluation, EPA concluded that the Alternative 4c provides the best balance of trade-offs among the alternatives with respect to the nine NCP criteria that EPA used to evaluate alternatives.

EPA cannot comment on what The Tribes' plans were for the Site in the early 1960s.

11.3 Comment: A cleanup decision can not be made at this time because the Risk Assessment is flawed. [6]

Response: EPA does not agree that the Streamlined Risk Assessment is "flawed". The Streamlined Risk Assessment was developed in accordance with CERCLA, the NCP, and EPA guidance. It is sufficient to support EPA decision making with regard to an interim response action at the Site, and contains no deficiencies that would prohibit it from being used for this purpose. If the commentor is stating that the Streamlined Risk Assessment should be a comprehensive baseline risk assessment, then the commentor should see the Responses to Comments 2.1, 2.1.1, 2.1.2, 2.2, 2.3.1 and 2.3.2. For information about the 1988 data quality, see Responses to Comments 2.9.2, 2.9.3 and 2.9.4.

11.4 Comment: Commentor asked if the risks in the "screening risk assessment" are accurate and real. [2]

Response: The Streamlined Risk Assessment provides a comparison of site data to "comparison numbers" considered to be protective of human health and environmental resources, which include chemical concentration standards, criteria, risk-based concentrations. Based on the results of the RI and the Streamlined Risk Assessment, which show exceedances of the comparison numbers in on-source and off-source media, EPA has concluded that an interim remedial action is necessary to address these risks. According to CERCLA, the NCP, and EPA guidance on presumptive remedies, the information and analyses provided in the Streamlined Risk Assessment are sufficient for decision making purposes regarding an interim remedial action. Appendices A and B of the Streamlined Risk Assessment provide additional information on how some of the comparison numbers were developed, and why exposure to chemical concentrations that exceed the comparison numbers is expected to lead to adverse effects. For a discussion of the target risk levels used by EPA from the Region III risk-based calculations and the MTCA Tables, see Responses to Comments 11.9, 11.10, 11.17, 11.31 (last bullet), 11.32, 11.33 and 11.38.

11.5 Comment: Commentor stated that a discussion of the various options for future development of the site should be included in the Risk Assessment because most readers will not have access to the land use document referenced in the report. [3]

Response: While a detailed discussion for future land uses was not included in the Streamlined Risk Assessment, conservative exposure assumptions were incorporated in the Streamland Risk Assessment to ensure that exposures associated with any possible future uses would be evaluated and considered during remedy selection. Historically, EPA has been criticized for selecting remedies that have, in effect, "placed a fence around a site" and prohibited any future productive use of the sited. Accordingly, relatively recent EPA guidance indicates that EPA should consider future land use during the remedy decision process as EPA has done at the Tulalip Landfill (EPA, 1995c).

The information requested by the commentor is contained in the Big Flats Land Use Program (Tulalip Tribes, 1994) document, referenced in the Streamlined Risk Assessment. This document is part of the Administrative Record for this project and is therefore accessible to the public. In summary, this document states that the Tulalip Landfill on-source area has been placed in an "commercial" use of the landfill surface should be limited to ensure the continued integrity of the containment system. The wetlands areas adjacent to the landfill have been placed in a "conservation" use category. According to the description of "Conservation" use, no development may occur in these areas with the exception of utility crossings.

It should be noted that a landfill cover it not an ideal surface for future development. While a landfill cover would allow some limited use or development on necessary to prevent damage to the cover system are included in the selected remedy. When design and construction are complete, EPA and The Tulalip Tribes will develop a document titled "Routine Use of Tulalip ('Big Flats') Landfill" that delineate which routine site uses may occur and which routine site uses shall not occur on the surface of the cover. Any commercial or development activity on the surface will require a written agreement between EPA and the Tribes to ensure the continued integrity of the cover.

As a point of clarification, the term "industrial" as defined by the Tulalip Tribes is different from the State of Washington MTCA definition of "industrial." See Responses to Comments 11.10, 11.37 and 11.38.

11.6 Comment: The commentor stated that extensive valuable ecological and chemical data collected during the remedial investigation were not, but should have been, used in the Risk Assessment **28** Specifically, the commentor requested a reason why the following data were not used: [3] [8] [17] [18]

- Studies of the degree to which landfill chemicals accumulated in shellfish and small mammals.

28 The commentor contradicts another comment he has made. See Comment 11.14, where the same commentor states that he is of the opinion that the off-source area should only be evaluated in a detailed risk assessment proposed as part of a non-presumptive remedy. All of the media that the commentor asserts in this (11.6) comment should have been included in the Streamlined Risk Assessment (shellfish, small mammals, etc.) are off-source data.

Response: Due to problems with the quality of some of the RI analytical data developed by the AOC Respondents, EPA required certain parts of the RI to be repeated, including sampling and analysis of shellfish and small mammals. Therefore, these data were not available for the Streamlined Risk Assessment. However, these data are not necessary to select an appropriate interim containment remedy for the Site. The Streamlined Risk Assessment is a complete document that contains sufficient information to proceed with selection of an interim remedy for the source area. These data are appropriately included and will be evaluated in the comprehensive baseline risk assessment, which will assess potential risks to the off-source wetland resources surrounding the landfill. Accordingly, the data will be available and used in the

comprehensive baseline risk assessment and remedy selection evaluation for the off-source area.

- Studies of the toxicity of sediments adjacent to the landfill to clams and amphipods.

Response: Due to problems with the quality of the analytical data, the AOC Respondents had to repeat the clam investigation; therefore, the toxicity studies could not be included in the Streamlined Risk Assessment. The amphipod test results were not be used in the Streamlined Risk Assessment because the purpose of the Streamlined Risk Assessment was to directly compare analytical chemistry results to available comparison numbers. Because the results of the bioassay will require a statistical evaluation and interpretation, these data will be evaluated in the comprehensive baseline risk assessment and remedy selection evaluation for the off-source area.

- Data on chemical residues in sediments, soils, surface waters and tissues of sculpin residing in surface water adjacent to the landfill.

Response: The commentor's assertion that these data were not used in the Streamlined Risk Assessment is incorrect. Detected chemical concentrations in sediments, soils, surface water, and sculpin were incorporated into the Streamlined Risk Assessment and evaluated. Section 2 of the Streamlined Risk Assessment summarizes the analytical data used in the Streamlined Risk Assessment (including sediments, soils, surface water, and sculpin tissues), and Table 2-1 in Section 2 lists the chemicals detected in on-source (surface water, leachate seep SP01, surface soil, Zone 1 and Zone 2 groundwater) and off-source (surface and subsurface soil, surface and subsurface sediment, surface water, leachate seeps SP02-SP11, fish tissue) media. Numerous chemicals were found in sediments, soils, surface waters, and/or fish tissues at levels that exceed comparison numbers considered to be protective of human health and the environment, including polycyclic aromatic hydrocarbons (PAHs), PCBs/pesticides, and inorganics.

The presumptive remedy guidance specifies that the Agency does not need to evaluate all exposure pathways in a streamlined baseline risk assessment. See Response to Comment 11.16.

11.7 Comment: The commentor felt that the 1986 surface water data incorporated into the Risk Assessment should not have been used because on-site activities at the time of collection may have caused non-representative contamination of this medium. Also, the commentor stated that the analytical techniques used in the 1988 investigation are unreliable, and five samples are not sufficient to characterize the 143-acre site. [3]

Response: The 1988 sampling design took the possibility of cross contamination into account by placing sampling locations away from any on-site activities. As summarized in section 11 of the 1988 E&E report, a site inspection was conducted prior to sampling to document on-site activities and to determine sampling locations that would not be affected by on-site activities. Consequently, EPA has no reason to believe that cross contamination of the landfill surface/pooled water is a result of contamination of the construction debris disposed on-site in 1988.

EPA believes that the 1988 data is reliable (see Response to Comments 2.9.2 and 2.9.3.). However, EPA notes that the 1998 data may be relatively less useful for purposes of making decisions with regard to an interim action at the Site than data collected during the RI because it is older. Clearly, the 1988 data represent 1988 Site conditions, which is useful information; however, the data may not represent current Site conditions. The 1988 data was used in conjunction with the data collected for the RI to evaluate on- and off-source exceedances in the Streamlined Risk Assessment. The 1988 data included surface soil and surface water from the landfill surface. The 1995 RI data from leachate seep SPO1 was used to determine the condition of leachate coming from the landfill surface. EPA notes that the RI data from seep SP01 exceeded comparison numbers for some chemicals, including phenanthrene, dissolved iron, dissolved lead, total cyanide, total iron, total lead, heptachor, Aroclor 1016, and ammonia (see interim ROD (Table 6-4).

Regarding the comment that "five samples are not sufficient to characterize the 143-acre site," EPA agrees that the five samples are insufficient to fully characterize the entire 143-acre landfill surface. However, it would be inappropriate to conclude that just because the 5 samples do not fully characterize the landfill surface, that the data is therefore totally useless and should be completely ignored. The Streamlined Risk Assessment included these 5 samples and measured the results against "comparison numbers"--- chemical concentration levels that are considered protective of human health and the environment. The Streamlined Risk Assessment indicates that in 1988, at 5 sample locations on the landfill surface, concentrations of some chemicals in surface water exceeded levels that are considered protective of human health and the environment. EPA believes it is more appropriate to consider such information, while keeping in mind the potential limitations of its usefulness, than to ignore it. See Response to Comments 2.9.2 and 2.9.3.

11.8 Comment: Commentor asked if the EPA used ecological data as well as background data in the Risk Assessment. [1]

Response: Not all of the ecological data collected during the remedial investigation were available at the time the Streamlined Risk Assessment was prepared. See Response to Comment 11.6. Some of the data (mammal tissue, clam tissue) submitted by the AOC Respondents were of poor quality and could not be used at the time the Streamlined Risk Assessment was being developed. The reasons some of the data could not be used include inappropriately high detection limits for the tissue data and the loss of tissue samples in the laboratory for the clam bioassay due to inappropriate sample preparation. Analytical data available for fish tissue was incorporated into Section 2 of the Streamlined Risk Assessment. In this section, trends in chemical detections across media were analyzed (Streamlined Risk Assessment, Table 2-1). See Responses to Comments 11.111 - 11.115.

11.9 Comment: Commentor stated that the screening values used in the human health evaluation are not enforceable and do not constitute "criteria." [3]

Response: EPA disagrees with this comment. The commentor appears to be implying that EPA can only use promulgated standards when evaluating human health risks at a Superfund site. Neither CERCLA nor the NCP require the use of promulgated or enforceable standards in determining acceptable levels of risk at CERCLA sites. EPA has appropriately used existing state and federal standards to identify levels which, if exceeded, indicate a human health or environmental risk at the Tulalip Site. In the absence of enforceable standards or criteria, EPA appropriately uses existing risk-based chemical concentrations which provide a basis for determining levels of risk to human health or the environment at a given site. The EPA guidance document "Streamlining the RI/FS for CERCLA Municipal Landfill Sites" (EPA, 1990a) states on Page 3 that the scope of the baseline risk assessment can be streamlined or limited by "identifying all pathways that are an obvious threat to human health or the environment ... by comparing RI-derived contaminant concentration levels to standards that are potential chemical-specific ARARs for the action... When Potential ARARs do not exist for a specific contaminant, risk-based concentrations should be used." [emphasis added]. Consequently, Region 10 used the Region 3 risk-based concentrations because Region 10 considered the exposure assumptions and target risk levels used in the Region 3 risk-based concentrations to be appropriate for the Tulalip Site. See Response to Comment 11.10.

In total, EPA has recorded numerous exceedances of comparison numbers that are considered to be protective of human health and the environment at the Site. Site investigation efforts, including sampling done recently by certain PRPs as part of the RI, indicate that landfill leachate leaving the Site exceeds comparison numbers for pesticides such as DDT and aldrin, polychlorinated biphenyls (PCBs), and heavy metals and other contaminants including chromium, copper, lead, mercury, nickel, zinc, ammonia, and heptachlor. The RI documents the presence of hazardous substances contaminating soils, sediments, surface water, and groundwater at the Site. Hazardous substances found in surface soils at the Site exceeded comparison numbers in one or more samples at eight of the nine leachate soil grid locations. At six of the leachate soil grid locations, subsurface soil samples were collected. Hazardous substances found in these subsurface soils exceeded comparison numbers in five of the six subsurface soil samples. Hazardous substances found in leachate exceeded comparison numbers at least once in most of the eleven seeps that were tested. Chemicals detected in Zorre- I groundwater (located within the refuse layer of the landfill) exceeding comparison numbers consisted of the metals copper, lead, nickel, and zinc, as well as ammonia, cyanide, and the pesticide heptachlor epoxide. The studies found that Zone 2 groundwater (located below the refuse layer) was contaminated at levels exceeding comparison numbers for the metals copper, lead, and nickel, as well as cyanide and ammonia. Thus, it is clear that there are exceedances of chemical-specific criteria to all media evaluated during the RI/FS at the Tulalip Landfill Site which warrant the taking of the interim remedial action specified in the interim action ROD in order to protect human health and the environment. See Response to Comment 2.5.5.

11.10 Comment: Commentor asserted that the "screening level" Risk Assessment misapplied both the EPA Region III risk-based concentration (RBC) and the cleanup levels defined by the State of Washington's Model Toxics Control Act (MTCA). Commentor argued that the EPA Region III RRCs, as defined by the EPA, are not intended to be used as cleanup goals or no-action levels at CERCLA or RCRA sites. Commentor indicated that EPA has applied MTCA cleanup standards at other hazardous waste sites in Washington state where EPA was involved. [3]

Response: EPA disagrees that human health criteria were used inappropriately. The risk-based concentrations used were not indicated to be the appropriate cleanup levels, they were used in the Streamlined Risk Assessment to assess risk. Risk assessment is a distinctly different process than the process to establish cleanup numbers. EPA uses risk-based concentrations when established standards or criteria are not available. MTCA soil cleanup standards for "commercial/industrial" sites, calculated under WAC 173-340-740 were also used for comparison in the Streamlined Risk Assessment. See Responses to Comments 2.5:4, 11.9, 11.37 and 11.38.

11.11 Comment: The commentor suggested that the document's title, "Draft Final Risk Assessment for the Tulalip Landfill Interim Containment Remedy," incorrectly states that it provides justification for an "Interim Containment Remedy." The commentor suggested that the document is in reality being-prepared as part of the Source Area Containment studies and any references to an interim containment study should be removed.

Commentor also indicated that the document, as currently presented, is not a complete risk assessment, and that any further versions of the document should be prepared in accordance with the four steps of risk assessment as defined by the NCP before being identified as a risk assessment. [31

Response: The title of the final document was changed to Tulalip Landfill Risk Assessment for Interim Remedial Action to address the commentor's concern.

EPA disagrees with the commentor's assertion that the Streamlined Risk Assessment is an "incomplete" assessment, see the Responses to Comments 2.1, 2.1-1, 2.1.2., 2.2, 2.3, 2.3.1 and 2.3.2. The Streamlined Risk Assessment has, in fact, been prepared in accordance with all four components (albeit streamlined) of a more detailed risk assessment. These components are: (1) hazard identification and dose (stressor), (2) response assessment (combined in an ecological effects assessment component), (3) exposure assessment, and (4) risk characterization. In the Streamlined Risk Assessment, the hazard identification and dose step of a risk assessment was met by identifying the chemicals which were detected in on-site media and by listing the ranges of the detected concentrations. The response assessment step consisted of identifying toxicity information (in terms of risk-based concentrations and criteria) to compare to the detected chemical concentrations. In the exposure assessment step, ecological receptors (e.g., marine organisms) and human receptors (e.g., future site workers) were identified to support the selection of appropriate toxicity information (selected in the response assessment step). Finally, the risk characterization was conducted by comparing the range of detected chemical concentrations (identified in the hazard identification step) to the appropriate toxicity information (gathered from completing the response assessment and exposure assessment steps). Risk characterization results were discussed in terms of frequency and magnitude of exceedance of risk-based concentrations and criteria.

11.12 Comment: Commentor asserted that the use of the term "interim remedy" was incorrectly used throughout the Risk Assessment. Commentor suggested that an interim remedy is applied only to reduce imminent threats to human and environmental health, a condition considered by the PRPs as not present at the site. In addition, a citation to page 1-1, 1st paragraph was requested. [3]

Response: The commentor is incorrect in stating that EPA may only utilize an interim remedy in circumstances presenting an imminent and substantial danger. Section 104(a)(1) of CERCLA authorizes a response action whenever "(A) any hazardous substance is released or there is a substantial threat of such release into the environment, or (B) there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare[.]" (emphasis added). See 42 U.S.C. § 9604(a)(1). In this case, the release of many different hazardous substances into the environment has been documented in the RI/FS that is in the administrative record. For example, data in the RI/FS shows that there are numerous exceedances of comparison numbers considered protective of human health and the environment, including specific health-based and ecological standards, criteria, and risk-based concentrations. Because there are documented releases of hazardous substances on the Site, EPA may undertake a response action at the Site regardless of whether those releases pose an imminent and substantial danger to the public health or welfare. However, EPA has determined these releases of hazardous substances also do pose a potential imminent and substantial endangerment to human health and the environment. See Section 6.3 of the interim ROD, which states that "[clomparison of the measured chemical concentrations to the human health risk-based and ecological effects-based criteria established under other environmental programs reveals potential risks to humans and the environment. Based on the RI/FS and findings in the Streamlined Risk Assessment, EPA finds that actual or threatened releases of hazardous substances from the Site, if not addressed by the selected alternative or one of the other active measures considered, may present an imminent and substantial endangerment to public health, welfare, or the environment."

Congress, in Section 121 of CERCLA, specifically contemplated early or interim actions, by allowing EPA to waive ARARs in such cases. In addition, the NCP preamble states that:

> EPA encourages the implementation of interim action operable units, as appropriate, to prevent exposure or control risks posed by a site." See 55 Fed. Reg. 8705.

Thus EPA clearly has the ability under CERCLA and the NCP to address risks posed by a site by using early or interim actions, even where those risks do not pose an "imminent" threat.

11.13 Comment: Commentor stated that EPA's Tulalip Landfill "screening risk assessment" was not conducted according to EPA guidance and can only be used to determine which pathways are not of concern, not to establish the need for remediation. Also, the commentor stated that the Risk Assessment used default exposure assumptions. [3]

Response: The Streamlined Risk Assessment was developed fully in accordance with EPA's guidance on risk assessment for presumptive remedies (EPA, 1990a and EPA, 1993a). Streamlined risk assessments are appropriate for many sites where presumptive remedies have been conducted by EPA, such as landfills. These risk assessments cat be used to determine whether early remedial action is warranted to limit or eliminate

releases from source areas. A comprehensive baseline risk assessment would typically be conducted thereafter to address off-source areas of such sites. EPA believes that it is appropriate to use default exposure assumptions for streamlined risk assessments unless site-specific deviations from such values are readily available. See Responses to Comments 11.9 and 11.11.

The commentor did not provide a reference to the guidance he claims EPA has followed; therefore, EPA cannot specifically address his concern. For more discussion about the appropriateness of using a streamlined risk assessment for the Tulalip Site see the Responses for Comments 2.1.2, 2.2, 2.3.1, and 2.5.4.

11.14 Comment: The commentor suggested that the document did not adhere to the scope of the investigation as defined in the presumptive remedy guidance. Commentor suggested that receptors and pathways evaluated as part of the presumptive remedy inappropriately included off-site receptors and addressed exposure pathways outside the source area. It is the opinion of the commentor that the off-source areas should only be evaluated in a detailed risk assessment prepared as part of a non-presumptive remedy. **29**[3]

Response: Because the leachate from the landfill exits from the berm into the off-source areas, an off-source evaluation is appropriately included in the Streamlined Risk Assessment to qualitatively determine to what extent the chemicals in the leachate have impacted the surrounding water bodies and wetland areas. The presumptive remedy of containing the landfill waste is designed to prevent chemicals in the source area from migrating to off-source areas. Therefore, it is very appropriate to evaluate the off-source areas in light of potential remedies for the source area. The Streamlined Risk Assessment was conducted to document potential adverse effects associated with the landfill (e.g., leachate). Therefore, it is appropriate, and consistent with EPA's presumptive remedy guidance, to evaluate off-source receptors, in addition to on-source receptors, that may be affected by contaminants from the landfill. See Response to Comment 11.95.

11.15 Comment: Commentor suggested that the Risk Assessment was not prepared in accordance with the Presumptive Remedy Guidance (U.S. EPA 1993) and the specific purpose of the document is not clearly stated. Further, the commentor indicated that no regulatory background information is provided in the text to provide the reader an understanding of the context within which the evaluation was conducted. Commentor requested that the EPA guidance referred to in the 1st paragraph of the Executive Summary under the discussion of "available criteria" be cited (including pages). [3]

29 EPA notes that the commentor's opinion in this comment that the off-source areas should not have been evaluated in the Streamlined Risk Assessment is in conflict with this same commentor's assertions in Comment 11.6 in which the commentor asserts that some off-source data (mammal tissue, clam tissue, etc.) that was unavailable for inclusion in the Streamlined Risk Assessment should have been included in the Streamlined Risk Assessment.

Response: EPA prepared the Streamlined Risk Assessment fully in accordance with EPA's Presumptive Remedy for CERCLA Municipal Landfill Sites guidance (EPA, 1993a) and other EPA presumptive remedy guidance EPA, 1998, 1991, 1995a, and 1995c). See Responses to Comments Sections 2.1, 2.2, and 2.3. The regulatory background information the commentor has requested is presented in the Introduction (Section 1) of the Final Tulalip Landfill Risk Assessment for Interim Remedial Action. Specifically, the purpose of the Streamlined Risk Assessment is to identify potential exposure pathways and compare relevant site data to existing comparison numbers. The citations for the comparison numbers are contained in Sections 3 (pages 3-1, 3-2, 3-3) and 4 (pages 4-2, 4-3) of the Streamlined Risk Assessment.

11.16 Comment: Commentor does not agree that "EPA guidance for the presumptive remedy risk assessment states that it is not necessary to calculate multi-chemical, multi-pathway risks to initiate the remedial action" [3]

Response: EPA disagrees with the commentor. The presumptive remedy guidances (EPA, 1990a and EPA, 1993a) clearly provides for the initiation of remedial action without the calculation of multi-chemical, multi-pathway risks having been performed. See the Responses to Comments 2.1, 2.2, and 2.3 for EPA's explanation regarding the appropriate use of a streamlined baseline risk assessment for selecting a interim remedy at a Site where a presumptive remedy approach is appropriate.

11.17 Comment: Commentor does not agree that an exceedance of regulatory criteria by one sample would trigger remedial action at any site. [3]

Response: The "Presumptive Remedy for CERCLA Municipal Landfills" (EPA, 1993), clearly states that "where established standards for one or more contaminants in a given medium are clearly exceeded, remedial action generally is warranted." See the Responses to Comments 2.1.2 and 2.5.2 for a more detailed response. Also, EPA notes that the Agency has concluded in the interim ROD that early, interim action to contain the landfill waste is appropriate at the Tulalip Site based not on one exceedance of a comparison number, but on

the exceedance of 1367 comparison numbers in many different media. See Response to Comment 2.2 -- the table with the number of exceedances.

11.18 Comment: Commentor stated that very few of the general and specific comments supplied by Parametrix on the "Draft Final Tulalip Landfill Risk Assessment for Interim Containment Remedy" were addressed in the "Final Tulalip Landfill Risk Assessment for Interim Containment Remedy." [3]

Response: All of the Respondents' comments on the Draft Final Tulalip Landfill Risk Assessment for An Interim Containment Remedy have been addressed by EPA, either through revisions to the Streamlined Risk Assessment or in the Responsiveness Summary. In EPA's letter of August 4, 1995 (Winiecki, 1995c) (of which the commentor was carbon copied), the Agency stated that it considered all comments submitted by Parametrix and when EPA issued the final Streamlined Risk Assessment. Additionally, EPA stated that it intended to provide written responses to outstanding comments (comments not addressed in the Final Streamlined Risk Assessment) in the Responsiveness Summary for the ROD. Those outstanding comments have been added to this document. See Response to Comment 2.5.1.

11.19 Comment: Commentor asserted that it is inappropriate at this time to state that remedial action is warranted at the site because of the number of the errors and deficiencies in the Draft Final Risk Assessment. Further, the commentor stated that the purpose of a "screening level risk assessment" is to identify chemicals of potential concern and eliminate pathways and chemicals of negligible risk. [3]

Response: All significant errors and deficiencies were addressed before the final Streamlined Risk Assessment was produced. See Response to Comment 2.5.1 and 11.18. According to EPA guidance, including "Presumptive Remedy for CERCLA Municipal Landfill Sites" (EPA, 1993a); and "Streamlining the RI/FS for CERCLA Municipal Landfill Sites" (EPA, 1990a), the Final Tulalip Landfill Risk Assessment for Interim Remedial Action, dated August 1995, is a streamlined baseline risk assessment that is appropriately used to identify the need for interim remedial actions. See Response to Comment 11.13.

11.20 Comment: Commentor stated that several figures in Section 2 of the Risk Assessment were mis-titled (Figures 2-2 through 2-6). [3]

Response: EPA can not identify any errors in the titles of the figures to which the commentor refers. All figures are properly numbered and titled in the Streamlined Risk Assessment.

11.21 Comment: Commentor noted that pages 2-8, 3-3, and 3-4 were not contained in the draft Risk Assessment. [3]

Response: All pages are contained in the final Streamlined Risk Assessment. Pages 2-8 and 3-4 in the draft Streamlined Risk Assessment are intentionally blank.

11.22 Comment: Commentor stated that the word "in" should be "for" on page 2-1, 5th paragraph, in the last complete sentence on the page. [3]

Response: EPA has noted the commentor's grammatical edit.

Human Health Risk Assessment Comments

11.23 Comment: Commentor stated that surface and subsurface soil should not have been evaluated because future excavation of the landfill is unlikely. [3]

Response: As a point of clarification, subsurface soil data from the landfill source area was not available and therefore not used in the Streamlined Risk Assessment. only surface soil data for the source area from the 1988 data set was available for use the in the Streamlined Risk Assessment. The presumptive remedy guidance (EPA, 1993a), states on page 5, "(s)treamlining the risk assessment of the source area eliminates the need for sampling and analysis to support the calculation of-current or potential future risks associated with direct contact.". The Agency has found in the its experience that surface and subsurface soil data play a small role in the data used to select a remedy. Therefore, for the Tulalip Site, the Agency did not focus on gathering subsurface soil data or additional surface soil data (beyond the 1988 data gathering effort.)

EPA agrees with the commentor that "future excavation of the landfill is unlikely." Institutional controls such as land use restrictions designed to protect the integrity of the landfill cover could prohibit excavation. However, exposure to subsurface soil and sediment in the off-source areas is possible under the future use exposure scenarios that have been identified for the Site. Although the off-source area has been placed in the "Conservation" use category by the Tulalip Tribes in "Big Flats Land Use Program" (Tulalip Tribes, 1994) **30**, subsurface soil and sediment may be contacted in this area if there is need to place utility lines to support on-source development. This is a likely scenario because restrictions made on

penetrating the cap could necessitate locating utility lines in the off-source area. Also, people working at a future industrial/commercial on-source facility may elect to use the off-source area for recreational purposes such as fishing, hiking and kayaking on a frequent basis. Therefore it must be considered possible that a person could contact off-source subsurface soil and sediment. For information about the "Conservation" category see the Response to Comment 11.5.

11.24 Comment: Commentor stated that fish consumption is not a complete exposure pathway in the off-source area because Tribal fishermen will not harvest the tideflat species present there. [3]

Response: Fish consumption is a complete exposure pathway. Tribal members consume bottom fish (i.e., resident, sediment-dwelling fish) caught in the vicinity of the Site. **31**

11.25 Comment: Commentor stated that use of a 10-6 cancer risk level is inappropriate for children because they are exposed for a sub-chronic duration of time, not the chronic exposure assumed in recommending an acceptable risk level of 10-6. [3]

Response: The use of a 10-6 cancer risk level is appropriate for children because, due to their small body size and greater potential for exposure (e.g., their higher ingestion rate of soil), they are considered a sensitive population which is typically protected by using a 10-'6 cancer risk level for a target risk. It does not matter whether a child's exposure is chronic or subchronic because cancer risk is considered cumulative over a lifetime, i.e., a 10-6 cancer risk level would be considered appropriate whether the exposures occurred over a few months or many years.

30 Note that the Tribes designation system for land use is different from the designation system specified in MTCA.

31 Personal communication, Eric Winiecki, EPA Remedial Project Manager, with Tom McKinsey, Tulalip Superfund Coordinator, January 19, 1996.

11.26 Comment: Commentor stated that chemicals with a low frequency of detection should have been dropped from the evaluation. [3]

Response: The purpose of the Streamlined Risk Assessment was to identify the magnitude and location of exceedances of comparison numbers including risk-based concentrations and ambient water quality criteria for hazardous substances released from the landfill. Considering the heterogeneous nature of a landfill (and the associated leachate leaving it), the appropriateness of eliminating a contaminant based on frequency of detection is questionable. The magnitude of the detection must also be considered in the risk assessment approach. If a contaminant is detected infrequently but has a very high concentration, an exposure risk still exists. Eliminating a contaminant, in most cases, based on frequency of detection is not advocated by EPA guidance.

11.27 Comment: Commentor stated that it is both incorrect and inconsistent with EPA's own Presumptive Remedy Guidance to apply a future industrial/commercial use scenario (with children at a day care facility) to the Tulalip site and then use this scenario to identify risks which must be mitigated off-source. Commentor goes on to state that the future use specified (industrial/commercial) is not considered appropriate for the Tulalip Landfill site because former landfill sites are not expected-to support such uses. [3]

Response: The Tulalip Site includes both on-source and off-source areas. In light of the proposed future land uses identified in the Big Flats Land Use Program (Tulalip Tribes, 1994), exposure of children and adults to both on-source and off-source areas is a reasonable scenario. See the Response to Comment 11.5 for a more detailed description of the proposed future land uses for the site. Evaluation of potential off-source health risks is appropriate and consistent with the Presumptive Remedy Guidance. See Responses to Comments 11.14 and 11.95.

EPA guidance specifies that the Agency consider potential future uses of a cleanup site before a remedy is selected to ensure that the selected remedy will not preclude potential uses that are important to the local community (Future Use of Superfund Sites, EPA, 1995c). See Response to Comment 2.7.2. EPA developed this policy regarding future use because in the past, some of the cleanup decisions the Agency made at certain sites were criticized for preventing or inhibiting productive future use of the sites. EPA has accordingly considered future uses in its approach to the Tulalip Site.

Landfills remediated with covers have been developed for productive uses (e.g., parks) other than as a landfill after the landfill has been closed and covered. EPA believes that more landfill closures should be designed to accommodate future use of the landfill surface. Reuse of previously contaminated property in a manner that is protective of human health and the environment is beneficial to the community and goes

hand-in-hand with EPA's national "Brownfield" initiatives. Remediating a site that is not compatible with some type of future productive use (e.g., recreational use) is a loss to the community and society as a whole. Reuse of remediated property lessens the pressure on communities to develop undeveloped property.

The selected remedy includes institutional controls. These would include controls on use of the Site, such as land use restrictions that limit or prohibit development or activities conducted on the Site so as to not interfere with performance of the selected remedy, and to prohibit activities that are not protective of human health and the environment. When design and construction of the interim remedy are complete, EPA and the Tulalip Tribes shall develop and approve a document entitled "Routine Use of Tulalip ('Big Flats') Landfill," the purpose of which shall be to ensure the continued integrity of the cover system. This document shall delineate routine site uses that may occur on the surface of the cover and uses that shall not occur, in accordance with the land use restrictions established in the interim ROD. This document shall be implemented at the Site in perpetuity, or until EPA and The Tulalip Tribes determine in writing that implementation of the document is no longer necessary at the Site. After the document is approved by EPA and The Tulalip Tribes, the document can only be modified by mutual written agreement by both EPA and The Tulalip Tribes.

Any commercial or development activity on the landfill surface will require advance, written agreement between EPA and the Tribes to ensure the continued integrity of the cover system and to ensure protection of human health and the environment.

A clearly visible sign shall be placed and maintained into perpetuity at the landfill entrance which summarizes the activities that may occur on the landfill cover, and shall also summarize the restrictions on use, as described in the "Routine Use of Tulalip (Big Flats') Landfill" document. The sign shall include the phone number of a Tribal officer or employee who is familiar with the requirements of the "Routine Use of Tulalip ('Big Flats') Landfill document and is able to provide direction to potential users of the Site regarding the document.

11.28 Comment: Commentor noted that potential health risks from chemicals in sediments were estimated by assuming that a child at a day care facility built on-site would be exposed to the sediments 250 days/year. Commentor stated that this is almost certainly an overestimate of potential exposures because the sediments are tidally inundated and would require extensive stabilization and placement of fill material prior to construction of any buildings. [3]

Response: In the Streamlined Risk Assessment, EPA used reasonable, available risk-based concentrations (i.e., those calculated by EPA Region III and presented in MTCA) to address exposure a child may have at the Site, in this case a commercial exposure. It is assumed that if a commercial facility frequented by children were developed on the landfill surface, a child could reasonably wander into this area during the day while playing, receiving exposure during the estimated 250 days/year. In addition, 250 days/year is a possible exposure-frequency for a child recreational user if, for example, ballfields or other recreational facilities were placed on the landfill surface (there are no available exposure default criteria which address a recreational scenario). See Response to Comment 11.25.

11.29 Comment: Commentor states that it is inappropriate to compare off-source surface and subsurface sediment data to soil screening values for an industrial site because off-source biological resources are not directly exposed to on-source soils and sediments. [3]

Response: Future commercial/light industrial development of the on-source area could facilitate chronic exposure of off-source receptors to on-source contamination. For this reason, it is appropriate to compare off-source sediment data to industrial risk-based contaminants. See the Responses to Comments 11.23 and 11.31 (first bullet).

If the commentor is implying that the off-source area is not impacted by on-source contamination, see to the Response to Comment 11.95 for a discussion of contaminate migration from the on-source area to the off-source area.

11.30 Comment: Commentor states that using screening-level soil values to screen subsurface sediment data assumes that sediments will be routinely disturbed under the same scenario as mentioned for surface sediments, and that this is an unlikely scenario. [3]

Response: Subsurface sediments do not need to be routinely disturbed for there to be a chronic exposure condition. One excavation event or other significant disturbance may be sufficient to permanently relocate subsurface sediments to the surface where they would be available for continued, chronic exposure.

11.31 Comment: Commentor stated that the screening values used in the Risk Assessment were inappropriately applied to the media of concern, as follows: [3]

- Human health screening values based on industrial exposure were inappropriate to use because they are based on long-term exposures that are unrealistic for the off-site sediments.

Response: EPA believes it is appropriate to assume that a person could have long-term exposures to off-source sediments because on-source industrial development may require access to off-source areas, e.g., installation of utility lines in off-source areas to support on-source development. Also, people working at a future industrial/commercial on-source facility may elect to use the off-source area for recreational purposes such as fishing, hiking and kayaking on a frequent basis.

- There are not enough fish in the area to sustain a harvest needed for chronic exposure, therefore it is not reasonable to include screening for the fish ingestion pathway. [also 2]

Response: The surface water criteria are based on ingestion of "organisms" (e.g., any edible seafood, including fish, shellfish, squid), not just fish. EPA is not aware of any documentation supporting the commentor's statement that there are not enough fish available in the area of the landfill to sustain a harvest needed for chronic exposure. The "Preliminary Natural Resource Survey" (NOAA, 1991) prepared for the Tulalip Landfill Site, states on page 7:

> "Habitat in the Snohomish River Delta supports substantial fisheries. There are several large migratory runs of salmon in the Snohomish River. Pink, chum, coho, and chinook salmon migrate through the area primarily from August to December, although year-round migration occurs. During upstream migration. Habitats near the site provide critical transition habitat where salmon must acclimate before moving from a salt environment to freshwater migratory pathways. During outmigration, these habitats are used extensively by smolts and juveniles for nursery grounds.

Commercial Catch Areas 8a and Recreational Punch Card Area 8 are inclusive of the Snohomish River Delta ... In general, the annual commercial salmon catch has varied between roughly 1.0 and 1.7 million kg since 1986 ... An estimated 6 percent of the recreational catch of salmon reported for all of Puget Sound in 1988 was harvested from this catch area".

See also Response to Comment 11.24.

- EPA used EPA Region III Risk-Based Concentrations (RBCs) as a substitute for preparing a comprehensive baseline risk assessment.

Response: According to CERCLA, the NCP, and EPA presumptive remedy guidance, the streamlined baseline risk assessment that has been completed for this Site is appropriate and sufficient for evaluating the need for an interim containment remedy. Use of EPA Region III RBCs is an appropriate component of the Streamlined Risk Assessment. The EPA guidance document "Streamlining the RI/FS for CERCLA Municipal Landfill Sites (EPA, 1990a) states on Page 3 that the scope of the baseline risk assessment can be streamlined or limited by "identifying all pathways that are an obvious threat to human health or the environment ... by comparing RI-derived contaminant concentration levels to standards that are potential chemical-specific ARARs for the action... When potential ARARs do not exist for a specific contaminant, risk-based-concentrations should be used." [emphasis added]. Consequently, Region 10 used the Region 3 risk-based concentrations because Region 10 considered the exposure assumptions and target risk levels used in the Region 3 risk-based concentrations to be appropriate for the Tulalip Site. See Response to Comment 11.37.

The Streamlined Risk Assessment is not a "substitute" for a comprehensive baseline risk assessment. The Streamlined Risk Assessment is for decision making regarding an interim action for the containment of the landfill on-source area; the comprehensive baseline risk assessment will be used in deciding whether additional clean-up will be necessary in the off-source wetlands surrounding the landfill.

11.32 Comment: Commentor requested a detailed discussion of the assumptions underlying the U.S. EPA Region 3 screening values and the MTCA values, including an explanation of any changes made in the exposure parameters used in calculating these values. [3]

Response: EPA made no changes in the Region 3 parameters or the MTCA parameters used to calculate risk-based concentrations, nor was any reference made to changes. Therefore, EPA refers the reader to the Region 3 document for complete documentation of the derivation of these values. The reference for the Region III values is: EPA Region III Risk-Based Concentration Table (EPA, 1994). The reference for the MTCA values is: Model Toxics Control Act Cleanup Levels and Risk Calculations (CLARCII) Update (Ecology, 1995). See the Response to Comment 11.31 (last bullet).

Following preparation of the draft Streamlined Risk Assessment in March 1995, EPA Region 3 revised its soil risk-based chemical concentrations. For comparison purposes, these updated values have been incorporated into Tables and Figures in the interim ROD, where appropriate, and exceedances of these values were compared to what was reported using the 1994 values. Using the updated (1995) values, the following

exceedances were found:

Surface Soil

Chemical	Frequency of Exceedances
Aroclor 1242	2/106
Arsenic	91/93
Benzo(a)pyrene	3/106
Beryllium	2/106
Chrysene	1/106
Heptachlor epoxide	1/106

Subsurface Soil

Chemical	Frequency of Exceedances
Aroclor 1242	2/19
Arsenic	17/17
Benzo(a)pyrene	3/20

See also Response to Comment 11.33

11.33 Comment: Commentor requested more documentation of the rationale used to identify current and future exposure scenarios, exposure pathways, and exposure parameter assumptions. In addition, it was requested that sample calculations be presented, showing how screening values were derived. [3]

Response: While the Site is currently closed, the Site, as well as surrounding areas, have been used for recreation in the past. Potential future use scenarios for the on-source and off-source areas were identified in the Big Flats Land Use Program document (Tulalip Tribes, 1994) referenced in the Streamlined Risk Assessment. Specifically, the on-source area is proposed by the Tulalip Tribes for industrial use in the future, and the off-source area is proposed for use as a "conservation" area. See Response to Comment 11.5 for a description of potential future site uses.

The Streamlined Risk Assessment also listed references for the risk-based concentrations used. These references contain complete documentation of equations and exposure parameters used in computing risk-based concentrations. Because no modifications were made to these concentrations in preparing the Streamlined Risk Assessment, it was not necessary to reiterate this information in the Streamlined Risk Assessment. Detailed information on how some of the ecological "comparison numbers" were derived is included in the Appendices A and B of the Streamlined Risk Assessment. However, the November 1994 and October 1995 EPA Region III RBC Table and the MTCA RBC Tables have been added to the AR in response to the commentor's request. Included in these tables are the exposure assumptions and methods used to calculate RBCs.

11.34 Comment: Commentor requested that rationale be provided for the assumption of a three percent lipid concentration in fish in calculating water quality standards. Commentor asked if this was a site-specific assumption. [3]

Response: Justification for the assumption of a three percent lipid concentration in fish is provided in Section 3 of the Streamlined Risk Assessment in the reference cited for the surface water comparison numbers. The three percent lipid concentration is a national default value (Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance Final Rule. 40 C.F.R. Part 131, December 22, 1992), not a site-specific assumption.

11.35 Comment: Commentor states that the use of EPA's conservative arsenic screening criterion of 1.6 mg/kg not only misapplies its own guidelines, as set forth by EPA Region 3, but is also inconsistent with the more site-specific State of Washington clean-up regulations. The Model Toxics Control Act has a cleanup standard of 57 mg/kg for arsenic. [3]

Response: The RBCs for soil ingestion of arsenic at industrial sites, as provided in the Region III RBC Tables, was used appropriately. These values do not constitute cleanup levels, but were used to evaluate and identify areas at the site where exceedances occurred. Also used for this purpose was the MTCA method C arsenic risk-based value of 57 mg/kg and the background level of 7.3 mg/kg, identified by the Department of Ecology for the Puget Sound Basin. Throughout the Streamlined Risk Assessment, the more conservative values were used appropriately and were imparted greater weight in the evaluation process. For some constituents these were MTCA values; for others, values from the RBC Tables. See Response to Comment 11.10.

11.36 Comment: Commentor stated that according to MTCA, the risk-based screening value for arsenic in soil is lower than the natural background concentration. [3]

Response: The EPA risk-based concentration in soil is lower than the established regional background concentration. For this reason, both the MTCA risk-based concentration and the established regional background concentration were used for comparison in the Streamlined Risk Assessment.

11.37 Comment: Commentor stated that it was paradoxical that EPA screening values for carcinogens were adjusted to a reference risk value of 10-6 to account for the presence of children, yet MTCA values calculated for children under a daycare scenario use a 10-5 cancer risk level. [3]

Response: Section 3 of the Streamlined Risk Assessment text acknowledges the fact that different cancer benchmarks were used by EPA, as provided in the Region 3 or MTCA Tables, to calculate risk-based concentrations and explains why both sets of values are reasonable to consider for the site.

In using EPA Region III risk-based concentrations, chemical concentrations associated with target levels of a 10-6 cancer risk and a hazard quotient of 1.0 were selected for each chemical. It is unlikely that EPA would in any case select less conservative values for a streamlined baseline risk assessment, since the effect of the presence of multiple chemicals and media are not taken into consideration using table values. In fact, it is recommended by EPA Region 10 that target values of a 10-6 cancer risk and a hazard quotient of 0.1 be used for screening values. Therefore, it can be argued that the risk-based concentrations used in the Streamlined Risk Assessment were definitely not unduly conservative for the intended-purpose.

Soil cleanup standards for "industrial" sites, provided in WAC 173-340-745 were not considered for this site because the Tulalip Landfill does not meet MTCA's definition of an "industrial" site. The definition of an "industrial" site, as defined in the December, 1995 promulgated MTCA regulation SE 6123 (i.e., the "Ports Bill") which becomes effective in February, 1996 as follows:

> "Industrial properties" means properties that are or have been characterized by, or are to be committed to, traditional industrial uses such as processing or manufacturing of materials, marine terminal and transportation areas and facilities, fabrication, assembly, treatment, or distribution of manufactured products, or storage of-bulk materials, that are either:
>
> (a) Zoned for industrial use by a city or county conducting land use planning under chapter 36.70A RCW; or
>
> (b) For counties not planning under chapter 36.70A RCW and the cities within them, zoned for industrial use and adjacent to properties currently used or designated for industrial purposes."

The Tulalip Landfill does not meet this definition.

Because the comparison of residential MTCA cleanup standards to the site was not deemed warranted, EPA decided to use the equations and exposure assumptions given in WAC 173-340-740(4)(b)(iii) for commercial/industrial sites to establish risk-based concentrations for comparison in the Streamlined Risk Assessment. However, the risk-based concentrations calculated using the parameters listed in this standard do not represent MTCA cleanup standards because other factors such as additional exposure pathways (other than soil ingestion), protection of ambient water and surface water and cumulative risks would have to be considered pursuant to MTCA regulatory provisions. These additional factors could render final cleanup levels more conservative than the screening valued used for the Streamlined Risk Assessment.

The commentor also questioned the validity of using a target value of 10-6 (for carcinogens) for one set of risk-based concentrations (the EPA Region III RBCs) and 10-5 for the other (MTCA RBCs). The commentor asserted that EPA only used the Region III RRCs because they were more stringent than MTCA". In fact, the target value used for carcinogens is only one of many differences in the factors used to calculate the different RBCs. EPA uses the same target value for carcinogens for both industrial workers and residents in order to equally protect both groups. The differences in risk-based concentrations calculated by EPA Region III and MTCA stems from the differences in the assumed exposure durations, rates, ages, etc. The factors used by both groups are default values- neither can be said to be specific to the Pacific Northwest. one similarity between the risk-based concentrations calculated by EPA Region III and MTCA are that they both use a target value of 1.0 for noncarcinogenic effects. The net result of the use of different exposure factors by EPA Region III and MTCA is that MTCA risk-based concentrations are more conservative for noncarcinogens and EPA Region III risk-based concentrations are more conservative for carcinogens. Because the assumptions used by both EPA Region III and MTCA were determined to be reasonable for this site, it was prudent to use both sets of RBCs for comparison in the Streamlined Risk Assessment. See Response to Comment 11.38.

See also Responses to Comments 11.10 and 11.31.

11.38 Comment: Commentor stated that the MTCA values presented in Table 3-1 of the Risk Assessment document are residential, not industrial values. Commentor further notes that residential screening values are inappropriate to use to evaluate future land use, because future use of this site will not be residential. [3]

Response: EPA has not used any residential comparison numbers in the Streamlined Risk Assessment. The MTCA numbers presented in Table 3-1 of the Streamlined Risk Assessment are industrial numbers, as indicated. The commentor has incorrectly interpreted the MTCA risk-based concentrations. MTCA has two "industrial" risk-based concentrations for soil. One set of concentrations, in some industrial/commercial situations, is derived using methodology presented in WAC 173-340-740, Method C (the concentrations used in the Streamlined Risk Assessment). The other concentrations defined as soil cleanup standards for "industrial" are calculated using WAC 173-340-745. Using MTCA regulations, the Tulalip Landfill site does not qualify as "industrial" under WAC 173-340-745, but does qualify as an "industrial/commercial" site as described in WAC 173-340-740 (1)(c). The reviewer is directed to WAC 173-340-740 (1)(c), where the classification "industrial" is used to describe the comparison numbers derived under Method C. Residential comparison numbers were not used in the Streamlined Risk Assessment. See also Responses to Comments 11.10, 11.37 and 11.44.

11.39 Comment: Commentor stated that Figure 3-1 in the Risk Assessment inappropriately depicted "direct contact by humans" as a release mechanism for contaminants. [3]

Response: The commentor has misinterpreted the information presented in Figure 3-1. In this figure, "direct contact" represents a process by which soil has become contaminated from landfill waste (i.e., soil is in direct contact with landfill waste). In this context, it is a primary release mechanism to humans.

11.40 Comment: Commentor noted that the conceptual site model indicated that exposure to on-source soil was not a complete exposure pathway, but that associated text stated future recreational use of the site was possible. Correction of this inconsistency was requested. [3]

Response: The commentor has accurately pointed out an inconsistency between what is presented in Figure 3-1 and the accompanying text of the Streamlined Risk Assessment. Figure 3-1 should indicate that exposure to on-source surface soil is a viable exposure pathway for current/future recreational users. However, this inconsistency has no effect on the results of the Streamlined Risk Assessment because there are no comparison numbers available which address recreational exposure. However, pursuant to MTCA WAC 173-340-740(l)(d), cleanup levels for recreational sites shall be at least as stringent as WAC-173-340-740 Method C cleanup levels.

11.41 Comment: Commentor stated that the surface water screening criteria used for 1,2-dichlorobenzene and the soil/sediment screening value used for chlordane are incorrect in Table 3-1 of the Risk Assessment. [3]

Response: Both values are correct as presented in the Final Streamlined Risk Assessment.

11.42 Comment: Commentor stated on page 3-17, Section 3.3, 1st sentence, that "there were" should be deleted in the first sentence. [3]

Response: EPA has noted the commentor's grammatical edit.

11.43 Comment: Commentor stated that the second sentence in the fourth paragraph on page one of the Executive Summary should contain a caveat indicating that access to the site does not necessarily translate to a health concern based on chemicals identified in on-source media. [3]

Response: EPA believes that adding the caveat suggested by the commentor would be misleading. Many samples taken from on-source surface water (RI leachate seep SP01, and the five 1988 surface water samples), and RI data from the perimeter leachate seeps exceed comparison numbers that are considered to be protective of human health and the environment. Therefore, EPA has concluded that potential risks to human health and the environment are present at the Site. In addition, exposure to antibiotic-resistant microbiological pathogens, which have been found in on-source surface water, may be a potential health concern.

11.44 Comment: Commentor stated that the soil screening number listed for chrysene is the residential, not the industrial screening value, and that using the industrial screening value of 18,000 μg/kg, no criterion exceedance would be found. [3]

Response: No residential comparison numbers were used in the Streamlined Risk Assessment. The soil risk-based concentration identified for chrysene is an industrial/commercial risk-based concentration, as defined in WAC 173-340-740. It is not a residential concentration.

The risk-based concentration suggested by the commentor is for industrial sites as defined at WAC 173-340-745. As explained in paragraph 11.10 above, the Tulalip Landfill Site does not meet MTCA's criteria for using the industrial standards, and so the more stringent commercial/industrial standards at WAC 173-340-740 were used. See Response to Comments 11.10 and 11.38.

Ecological Evaluation Comments

11.45 Comment: The commentor questioned if the list of species identified as being on site was complete, and requested that a reference be provided for any ecological survey work conducted at the site. [3]

Response: The list of species at the site is based on review of information sources (E&E, 1988, and NOAA, 1991) for the area. In addition, EPA REAC performed an ecological survey in 1992 (Weston, 1992). This reference is included in the final Streamlined Risk Assessment document. These documents are included in the AR for the interim ROD. The list of species is not a complete list. Instead the list is a list of examples of species identified as being on site based on previous investigations.

11.46 Comment: Commentor stated that EPA made numerous conservative assumptions regarding the current or past presence and habitats of various organisms and species around the site. [3]

Response: Information relating to organisms and species at the Tulalip Site were obtained from independent biological surveys. No assumptions were made regarding the habitat types and organisms at the site. Please refer to Preliminary Natural Resource Survey, Tulalip Landfill, Marysville, WA, National Oceanic and Atmospheric Administration, 1991 (NOAA, 1991); and Draft Preliminary Site Assessment of the Tulalip Landfill, Letter from R. Henry (Weston REAC) to D. Charters, September 8, 1992 (Weston, 1992).

11.47 Comment: Commentor stated that the conceptual site model was confusing and requested that separate figures be provided for aquatic, terrestrial, and estuarine ecosystems. Commentor further noted that no explanation was given for how the dermal contact pathway would be evaluated for terrestrial birds and mammals. [3]

Response: The arrows have been modified in the referenced Streamlined Risk Assessment (Figure 4.1) to provide better clarification. Otherwise, EPA believes the figure is self-explanatory. The purpose of this model is to show interactions. Separate figures would defeat this purpose, therefore the figure was not changed. The small mammal and bird dermal pathway will not be evaluated separately from other pathways because the fur/feather barrier would prevent most of the exposure. However, any cleaning/preening behavior that results in ingestion of particulates that adhere to fur/feathers is considered in the ingestion pathway.

11.48 Comment: Commentor stated that the conceptual site model illustrates pathways of concern that are not appropriate or even plausible for selected media. Commentor listed the following specific concerns: [3]

- Under the terrestrial on-source soil pathway, mammals are exposed through the ingestion of water; the media of concern is soil, not water for this pathway.

Response: In the final Streamlined Risk Assessment, a separate exposure medium exists for water; therefore, the ingestion of water exposure route was removed from the on-source soil exposure medium.

- Under the leachate pathway for aquatic organisms, ingestion of soil/sediment is listed. Because lachate is considered a water matrix, clarify how fish and invertebrates are ingesting soil or sediment.

Response: Leachate contains soil/sediment particulates and these are potentially ingested along with the ingestion of leachate. This pathway is especially relevant for filter-feeding organisms such as clams.

- Clarify the above bulleted items as they pertain to the aquatic receptors in both on-source surface water and off-source surface water media.

Response: The exposure routes listed are appropriate for the media listed. The exposure media are considered all-inclusive. There may be multiple exposure routes in an exposure medium. For example, in the surface water medium, there may be ingestion of sediment/soil particulates suspended in the surface water. To address the range of exposure possibilities, all potential routes were included in the figure.

See Response to Comment 11.51.

11.49 Comment: Commentor requested that the results of the evaluation of on-source groundwater sampling be discussed for ecological receptors. [3]

Response: The Zone 1 groundwater exits the perimeter landfill berm in the form of leachate; therefore, the

Zone 1 groundwater was evaluated to determine chemicals of potential ecological concern. Zone 1 groundwater is also driven downward into Zone 2. Zone 2 groundwater exits into the sloughs and could adversely affect bottom-dwelling organisms. Both Zone 1 and Zone 2 groundwater were evaluated for ecological receptors by comparison to federal AWQC and state surface water standards. See the Responses for Comments 11.116 and 11.117 regarding dilution and mixing zone issues.

11.50 Comment: Commentor stated that the exposure pathways listed on page 4-1 should be presented as assumptions, not as definitions of exposure, because some of the listed exposure pathways are not plausible. [3]

Response: EPA disagrees. All of the exposure pathways listed are plausible, therefore they are appropriately referred to as "potential" pathways. It is assumed that these exposure pathways may result in an adverse effect from chemicals of concern at the Landfill. This discussion is a brief synopsis of potential exposure pathways based on current scientific knowledge in ecological risk assessment.

11.51 Comment: Commentor requested that an explanation be provided discussing why only certain exposure pathways were evaluated in the Risk Assessment. In addition, the commentor stated that there is no evidence in the Risk Assessment that direct contact with soil by carnivorous rodents was evaluated, as stated in the text. [3]

Response: Under the presumptive remedy approach, it is "not necessary to evaluate whether the containment remedy addresses all pathways and contaminants of concern associated with the source" in the Streamlined Risk Assessment (EPA, 1993a). The purpose of the conceptual site model is to illustrate the potential pathways for inclusion in the Streamlined Risk Assessment. The most probable scenarios were chosen for evaluation. For example, plant, aquatic organism (fish and invertebrates), and small mammals were evaluated in the Streamlined Risk Assessment. Exposure pathways included ingestion and plant uptake/sorption. These are both major pathways and there is literature available to associate effects with contaminant concentrations. Direct contact with soil was evaluated through the ingestion pathway.

11.52 Comment: In general, the commentor either did not agree with the "screening values, requested additional "criteria" or requested additional clarification regarding the "criteria". Also, the commentor had the following comments on specific "screening criteria" used in the evaluation: [3]

General Response: Table 4-1 was updated in the Final Streamlined Risk Assessment for the Interim Remedial Response with all the current EPA Ambient Water Quality Criteria (AWQC), including those for both dissolved and total metals. Average water quality values were used for pH (7.8) and hardness (100 ppm CaCO3) because these values are within site-specific ranges (5.9 - 8.0 pH; 76-1171 ppm CaCO) and are typical of most surface waters in the U.S. New criterion values resulted in additional exceedances; criterion changes did not change the final results. Appendix B contains a summary of the derivation of AWQC.

Specific Responses to the bulleted comments are provided in order, as follows:

- The surface water marine criterion used for 1,2-dichloroethane was incorrect.

Response: The criterion for 1,2-dichloroethene was corrected in the final Streamlined Risk Assessment document.

- Marine and/or freshwater toxicity values available from EPA for dichlorobenzenes, 2,4-dimethylphenol, acenaphthene, fluoranthene, naphthalene, phenol, DDD, DDE, aluminum, and silver are not all listed.

Response: The requested criteria were added in the final Streamlined Risk Assessment document.

- The surface water marine criterion used for lindane is incorrect.

Response: The criterion for lindane was corrected in the final Streamlined Risk Assessment document.

- The pH used in the calculation of the criterion for pentachlorophenol should be stated. Likewise, the hardness used to calculate the criteria for hardness-dependant heavy metals should be referenced. Commentor stated that a hardness of 100 ppm CaC03 is low considering the salinity of waters proximate to the landfill.

Response: Average water quality values were used for pH (7.8) and hardness (100 ppm CaC03) because these values are within site-specific ranges and are typical of most surface waters in the U.S.

- There are cases where acute criterion values are incorrectly referenced as chronic, and vice versa. This comment applies to values for 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, gamma-BHC, 4,4-DDT, arsenic, cadmium, copper, cyanide, lead, mercury, nickel, selenium, thallium, and zinc.

Response: The listed criteria are correctly referenced in Table 4-1 in the final Streamlined Risk Assessment.

- The use of a marine surface water criterion for chromium based on chromium VI is inappropriate. Commentor asked for justification for the use of this value. Commentor stated that only chromium III (not chromium VI) would occur in oxygenated surface water.

Response: Specific metallic speciation studies were not performed during the remedial investigation. Therefore it is not known what the chromium III levels are at the site. In addition, there is no chronic criterion for chromium III for saltwater. EPA believes it is reasonable to assume that the chromium VI chronic criteria would be protective of most aquatic organisms, therefore it was used.

- In contrast to what is stated in the Risk Assessment, the chronic toxicity of zinc is affected by hardness. In addition, the commentor noted that the most recent ambient water quality criterion for zinc was published in 1987, not 1980.

Response: Average water quality values were used for pH (7.8) and hardness (100 ppm CaC03) because these values are within site-specific ranges and are typical of most surface waters in the U.S. Reference to the AWQC 1987 zinc document is noted, however the process of deriving AWQC has not changed.

- EPA incorrectly stated that aldrin levels exceeded EPA ambient water quality criterion. Aldrin levels exceed the Washington standard, but not the EPA standard.

Response: There are no EPA chronic criterion for aldrin; however, there are EPA chronic criteria for dieldrin. Because aldrin is metabolically converted to dieldrin by aquatic organisms, toxicity is attributed primarily to dieldrin. The Washington state water quality criterion was used for aldrin, since there is no EPA chronic criterion. However, aldrin levels at the site exceeded the Washington State chronic criterion and the EPA chronic criterion for dieldrin.

- The freshwater chronic criterion for PCBs is incorrect.

Response: The criterion for PCBs is correct in the final Streamlined Risk Assessment document.

- There are dissolved metals criteria available under the Washington Water Quality standards which should have been used.

Response: The final Streamlined Risk Assessment document includes Washington water quality standards for both dissolved and total metals.

- The marine chronic criterion used for heptachlor epoxide is incorrect.

Response: The criterion for heptachlor epoxide is correct in the final Streamlined Risk Assessment document.

- Marine chronic criteria was inappropriately used to screen on-source surface water for the following chemicals: phenanthrene, chromium, copper, cyanide, nickel, and zinc. in addition, marine chronic criteria was inappropriately used to screen on-site groundwater for the following chemicals: heptachlor, endosulfan II, zinc, mercury, copper, chromium, lead, cyanide, and nickel.

Response: The final Streamlined Risk Assessment has been revised so that on-source surface water data is compared only to freshwater comparison numbers. The groundwater was appropriately screened against marine AWQC because the groundwater exits into an estuarine environment.

11.53 Comment: Commentor stated that the on-source pooled water is ephemeral and would not sustain a balanced community of aquatic organisms. Therefore, ambient water quality criteria are not appropriate "screening" tools for evaluating these waters. [3]

Response: The on-source surface water on Tulalip Landfill consists of semi-permanent ponded and saturated areas capable of supporting aquatic life. Amphibian, reptilian, and aquatic organisms may be in the ponded areas of the landfill. Obviously, there are no salmonids in the on-source surface water; however, it is appropriate to screen against AWQC because the AWQC are designed to protect a large range of aquatic organisms. See Appendix B in the Streamlined Risk Assessment, "Derivation of Chemical-Specific AWQC" for

more information about the AWQC.

11.54 Comment: Commentor suggested EPA inappropriately used outdated criteria for "screening" sediment toxicity (i.e., AETs) and should have used the current State SMS. Commentor argued that the EPA's stated rationale to not use the SMS due to the unavailability of dry-weight data and total organic carbon data is invalid. [3]

Response: The AETs and the SMS values are functionally equivalent, therefore either value can be used interchangeably. In Washington State, if a particular sample has an associated total organic carbon (TOC) value outside of the 0.5-3.0 range, AETs are used, in addition to SMS, for comparison to site data. Because many of the Tulalip samples have TOC numbers outside of this range, EPA considers comparison of site data to the AETs numbers to be an appropriate methodology. EPA believes comparison of site data to AET numbers is sufficient for the Streamlined Risk Assessment. The comparison numbers for sediment were based on the dry-weight normalized AET concentrations (PSEP, 1988). AETs were used in place of the Washington State Sediment Management Standards (SMS) (Chapters 173-204 WAC) in this assessment because the site data were reported on a dry-weight basis. The database for site data collected during the RI was not completed at the time of the Draft Final Tulalip Landfill Risk Assessment for Interim Remedial Action; nor were the Round 2 sediment data in the database (received October 24, 1995). Sample-specific TOC normalization will be performed in the comprehensive baseline risk assessment to determine which samples can be compared to the SMS (i.e., normalization can only be performed in the TOC range of 0.5-3.0 percent).

11.55 Comment: Commentor asserted that exceedances of the "screening values" does not de facto indicate that "adverse affects are expected to occur." Commentor suggested that any observations of exceedances of "screening values" may indicate a potential for adverse effects. [3]

Response: EPA believes that exceedances indicate a potential for adverse effects.

11.56 Comment: Commentor had the following comments on the shrew model: [3]

- Commentor requested an additional explanation regarding why the terrestrial model used for organic chemicals could not be used for inorganic chemicals.

Response: This model probably could be developed for inorganic chemicals. However, there were already a number of comparison numbers available for inorganic chemicals, so it was not necessary to develop a model for inorganics. Therefore, the model was only used for organic chemicals.

- Commentor stated that the units do not balance in the equation used for estimating the daily soil ingestion rate of a shrew.

Response: The equation balances. The food ingestion rate should be 3.0 kg earthworm/kg body weight/day. The conversion factor has already been incorporated into the equation. For additional clarification, consult the associated text on page A-4 of the Streamlined Risk Assessment.

- Commentor requested a reference to support the assumption that the shrew diet consists of 50 percent earthworms.

Response: This was a conservative assumption as stated in the Streamlined Risk Assessment. It is likely that the actual percentage exceeds 50%. The Wildlife Exposure Factors Handbook (EPA, 1993b) referenced on page 5-3 of the Streamlined Risk Assessment lists earthworms, slugs, snails, and ground-dwelling insects as making up over 50 percent of the shrew's diet, so 50% was used in the Streamlined Risk Assessment as a conservative assumption.

- Commentor requested clarification regarding which units are in wet weight, and which are in dry weight.

Response: The document has been clarified with respect to dry weight verses wet weight. As a point of clarification, earthworm wet weights were converted to dry weights.

- Commentor was unable to duplicate the calculated soil ingestion rate.

Response: The soil concentration is calculated correctly. The equation is 3.0 (kg fresh food/day) (daily food ingestion rate) X 0.5 (kg earthworm/kg fresh food) (proportion of diet that is earthworms) X 0.1 (kg soil/kg dry weight of earthworm) (amount of soil in earthworm) = 0.15 kg/kg body weight/day (soil ingestion rate). The conversion factor is already incorporated into the equation and the ingestion rate is 3.0 kg earthworm/kg body weight/day. Earthworm wet weights were converted to dry weight.

- Commentor requested clarification regarding why the shrew food ingestion rate was different from the shrew daily food ingestion rate.

Response: The food ingestion rate and the daily food ingestion rate are the same. There is a range in the daily food ingestion rate (1.3 to 4.5 times the body weight). For the purposes of developing ecological comparison numbers, it was assumed the shrew consumes three times its body weight (3.0 kg earthworm/kg body weight/day). See page A-4 of the Streamlined Risk Assessment for additional clarification.

- Commentor requested more information regarding the calculation of the ecological RBCs. Commentor was unable to reproduce the RBCs calculated for PCBs and DDT.

Response: Examples of calculations of ecological soil RBCs are as follows. Detailed information regarding the derivation and calculation of ecological soil RBCs can be found on pages A-1 through A-5 of the Streamlined Risk Assessment. The bioaccumulation factor for PCB (20) is multiplied by the food ingestion rate (3.0) and the soil ingestion rate (0.15) is added to this to calculate a total daily intake. In this case the total daily intake is 60.15 = [(20 X 3.0) + 0.15]. The toxicity reference value (TRV) for this chemical is 10.0. The TRV (10.0) is then divided by the total daily intake value (60.15) to get a RBC of 0.1662 ug/kg or 166.2 mg/kg. This number is rounded to the nearest whole number for the final RBC of 170 mg/kg.

The bioaccumulation factor for DDT (5.1) is multiplied by the food ingestion rate (3.0) and the soil ingestion rate (0.15) is added to this to calculate a total daily intake. In this case the total daily intake is 15.45 = [(5-1 X 3.0) + 0.151]. The toxicity reference value (TRV) for this chemical is 0.1. The TRV (0.1) is then divided by the total daily intake value (15.45) to get a RBC of 0.0065 ug/kg or 6.5 mg/kg.

11.57 Comment: Commentor stated that the text has not shown that plants are more sensitive to inorganics than shrews, and therefore the shrew model should have been used to derive RBCs for inorganic chemicals. [3]

Response: EPA agrees that this model probably could be developed for inorganic chemicals. However, there were already a number of comparison numbers available for inorganic chemicals, so development of the model for this purpose was not necessary. Therefore the model was only used for organic chemicals. The sensitivity of plants verses shrews is dependent on the chemical being evaluated. Therefore, chemical sensitivities were not investigated as part of the Streamlined Risk Assessment.

11.58 Comment: Commentor requested clarification of the statements made in Section 4.7 of the Risk Assessment. Commentor thinks EPA has inappropriately suggested that there is evidence of plant mortality at the Site, and states that discussing vole survival in the context of plant toxicity is inappropriate. Commentor also states that contrary to what EPA has stated, there is no evidence of a loss of shrews at the site, and that there is not enough scientific evidence available to indicate that chemicals such as PCBs are affecting organisms at a higher trophic level. [3]

Response: EPA is stating that there is potential for adverse effects based on the chemical concentrations at the Site. Potential adverse effects based on numerous exceedances of risk-based criteria are discussed in the Streamlined Risk Assessment. However, additional text, discussing the ecological significance of exceedances of the risk-based criteria, was added to this section in the Final Streamlined Risk Assessment document to clarify that potential mortality to lower trophic levels (e.g., plants) may have a negative impact on higher trophic levels (e.g., voles). Exposure to higher trophic levels will be evaluated in the comprehensive baseline risk assessment. It is general scientific knowledge that bioaccumulative compounds such as PCBs can adversely affect organisms in higher trophic levels (EPA, 1993b; Weston, Weston, 1995b). See Response to Comment 11.60.

11.59 Comment: Commentor stated that more references are needed to substantiate the adequacy of the RBCs selected for the protection of biota exposed to metals in soil. Commentor asked if plants are more sensitive to metals in the soil, as opposed to avian and mammalian receptors who are exposed through a soil-based food chain. [3]

Response: Comparison numbers, with associated references, for inorganics are presented in Table A-1. From these references, a range of comparison numbers were identified. From this range of comparison numbers, an average was determined and used in the Streamlined Risk Assessment.

In this Streamlined Risk Assessment, which relies upon comparing site contaminant levels to comparison numbers, EPA believes it is not necessary to evaluate birds and mammals with respect to inorganics because the presumptive remedy does not require all exposure pathways or receptors to be evaluated. Because plant comparison numbers were readily available for the Streamlined Risk Assessment, these were used to streamline the risk assessment. Bird and mammal tissue will be evaluated in the comprehensive baseline risk assessment. See Response to Comment 11.16.

11.60 Comment: Commentor requested an explanation of what constitutes ecological significance for effects in plants. '[3]

Response: Typically the mid-range of potentially deleterious effects were chosen as RBCs. Ecological significance in this context refers primarily to death. Effects such as "reduced weight" would probably not be ecologically significant. This was only chosen if other benchmarks bracketed (were higher and lower than) this value. Plant mortality is an example of an ecologically significant effect. Therefore, exceedances of these RBCs indicates that there is a potential for adverse effects to plants (and possibly plant consumers) at Tulalip Landfill. For example, if copper concentrations at the site are higher than the 100 ppm benchmark that indicates excessive toxicity to plants, this indicates there are potential detrimental effects at the Site from exposure to copper. There were soil samples in the off-source soil that exceeded the 100 ppm benchmark with concentrations of 129 and 135 ppm.

11.61 Comment: Commentor asked for justification for the assumption that terrestrial biota would be in contact with chemicals in soils to depths up to 1.5 feet. [3]

Response: Terrestrial organisms, particularly burrowing organisms (mole, otter), regularly contact soils to depths of 1.5 feet (EPA, 1993b). In addition, burrowing activity often results in the physical transport of deeper soils to the surface, which exposes non-burrowing organisms as well.

11.62 Comment: Commentor stated that in contrast to what EPA has stated, data is available for inorganic chemicals which addresses toxicity to mammals and birds. [3]

Response: A quantitative evaluation of birds and mammals was outside the scope of the Streamlined Risk Assessment. EPA expects to evaluate, quantitatively, bird exposure and mammal tissue in the comprehensive baseline risk assessment.

11.63 Comment: Commentor stated that it is inappropriate to conclude that elevated chemical concentrations may be a cause for the lack of sensitive species at the site. [3]

Response: Elevated concentrations of chemicals can adversely affect ecological organisms, especially sensitive species (amphibians, great blue heron, mink) and sensitive life-stages (juvenile). For example, mink are very sensitive to elevated PCB concentrations. PCBs have been detected in leachate seeps, surface and subsurface soils, fish tissue and mammal tissue at the Site. Some of these sensitive species (amphibians, great blue heron) have been observed in the vicinity of Tulalip Landfill (NOAA, 1991 and Weston, 1992). Exposure of mink to even very low concentrations of PCBs can lead to adverse effects such as death and reproductive failure. No population studies have been performed to date; however, the comprehensive baseline risk assessment for the off-source area will evaluate the impact these chemicals may have on sensitive organisms. In the risk assessment process only a select number of species, trophic levels, and exposure scenarios can be evaluated. In EPA's opinion, it is important to be fairly conservative in evaluating the risk associated with chemical concentrations because not every species and life-stage can be evaluated in a risk assessment. In the Streamlined Risk Assessment, elevated chemical concentrations detected at the Landfill were compared to concentrations that cause adverse effects in organisms. Some of the chemicals detected at the Landfill were at levels above these adverse effects criteria. Therefore, there is potential for adverse effects to both common and sensitive species in the vicinity of the Landfill.

11.64 Comment: Commentor stated that the ecological and biological data collected during the remedial investigation demonstrate that risks to fish and wildlife at the site, both terrestrial and estuarine, were either non-existent or negligible when compared to the data from the background locations. [3]

Response: EPA evaluated site data collected during the remedial investigation with regional background data in the Streamlined Risk Assessment and found exceedances of background. EPA did not use the site-specific background data collected during the remedial investigation in the Streamlined Risk Assessment because EPA did not have all the background data, e.g., (1) the clam data was not usable and new clam data had to be generated and (2) sediments had to be re-sampled. The site-specific background data will be evaluated in the comprehensive baseline risk assessment. See also Response to Comment 11.88.

11.65 Comment: Commentor stated that, as discussed in the Tulalip Landfill Remedial Investigation report, the bioassays that were conducted on off-site sediment samples indicate negligible risks to aquatic life. [3]
Response: The bioassay data will be appropriately evaluated in the comprehensive baseline risk assessment. See Response to Comment 11.88. However, preliminary evaluation of RI data indicates that sediments collected from numerous locations surrounding the Tulalip Landfill experienced relatively high amphipod mortality during the test. This indicates a potential for adverse effects for organisms exposed to sediment in the proximity of Tulalip Landfill.

11.66 Comment: Commentor asked for further clarification on what was meant by "groundwaterin the form of ponded areas." [3]

Response: This typographical error was corrected in the final Streamlined Risk Assessment. The phrase was changed to "surface" water.

11.67 Comment: Commentor noted that in contrast to EPA's data, the data available to Parametrix and the Respondents does not indicate an exceedance of chromium and nickel in off-source surface sediment. Commentor asked if these exceedances were found in EPA's split samples. [3]

Response: Concentrations of chromium and nickel exceeding the comparison numbers detected in EPA's split samples, but were not found in the Respondent's samples at levels exceeding the comparison numbers. Minor analytical differences such as these are common in split samples and could be the result of heterogenicity in samples, detection limit differences, laboratory variability, or other similar reasons.

11.68 Comment: Commentor asked for data to substantiate the statement that organisms used to develop specific AWQC were compared to organisms found at the site during EPA's Response, Engineering and Analysis Contract (REAC) investigation. Commentor also asked for specific data to back the statement that the AWQC were not developed considering organisms or life stages which are sensitive. [3]

Response: EPA is not prohibited from using a particular AWQC if the specific organism for that AWQC is not present on the Site. If organism similar to the organism on which an particular AWQC was developed is present, then that is sufficient for EPA use the associated AWQC to assess risk.

The commentor is directed to Appendix B (derivation of chemical-specific AWQC) of the Streamlined Risk Assessment for more information concerning the derivation of AWQC. To summarize, the EPA and Washington State AWQ standards were developed to protect a large range of aquatic organisms (many of these are found in the vicinity of Tulalip Landfill). The EPA REAC report (Weston, 1992) contains information relating to specific species identified at the Tulalip site. The AWQC are appropriate to use at Tulalip because many of the organisms used to develop AWQC are also found in the vicinity of Tulalip Landfill. However, water quality criteria are not necessarily protective of all species and all life-stages of wildlife. The AWQC are based on available data; new data can result in an updated criterion. For example, as additional species are tested in response to a contaminant, the criterion may change because additional information is gathered. This is because most of the criterion values are based on data from testing a variety of common aquatic organisms. More sensitive life-stages (i.e., juvenile) and more sensitive organisms (i.e., amphibians can be sensitive) are not often tested due to lack of commercial availability. As new tests are developed to investigate sensitive life-stages and organisms, lower criterion values (more conservative) can be developed.

11.69 Comment: Commentor requested that uncertainties related to the RI data be discussed in the uncertainty analysis section. [3]

Response: The RI data used in the Streamlined Risk Assessment was validated by the AOC Respondents' contractor and no problems in the data set used for this assessment were identified. A full evaluation of frequency of detection, detection limits, and other data quality issues is provided in Section 6 and Appendix L of the RI report (HLA, 1995). A brief discussion of the uncertainties associated with the detection limits is provided in Section 2.1 of the Streamlined Risk Assessment. Some of the uncertainties related to use of the RI data include elevated detection limits compared to comparison numbers (the data did not meet detection limit goals), interferences from salt water, and interferences from complex sample matrices (e.g., high organic content).

Detection limits exceedances have resulted in re-sampling of small mammals, therefore not all of the data was available for the Streamlined Risk Assessment. In addition, analytical errors resulted in re-performing the clam bioassay. This included re-sampling selected sediment stations. Analytical oversights also resulted in EPA re-evaluating the fish tissue PCB results. As an example, some of the sediment-detection limit exceedances due to salt and/or complex sample matrices can not be lowered; therefore, some of these samples may not be as accurate in predicting adverse effects.

For more information regarding the "1988 data," see the Responses to Comments 10.1 - 10.4.

11.70 Comment: Commentor asked whether EPA measured the hardness in the ponded water on the landfill surface, and if so why the freshwater chronic criteria were not adjusted according to this hardness. [3]

Response: Average water quality values were used for pH (7.8) and hardness (100 ppm CaC03) because these values are within site-specific ranges (5.9 pH; 76-1171 ppm CaCO3) and are typical of most surface waters in the U.S.

11.71 Comment: Commentor stated that tidal estuaries, such as the estuary which surrounds the landfill, typically do not contain the diverse populations that AWQC were established to protect. Respondents disagree that marine AWQCs should be ARARs to be used for direct comparison to leachate seeps and Zone 2 groundwater. EPA inappropriately denied the Respondent's request to conduct an aquatic life survey of the site. [3]

Response: Tidal estuaries, in contrast to the commentor's suggestion, do contain diverse ecological communities. In fact, tidal wetlands are the most diverse wetland systems. In addition, these areas are often used as nurseries for sensitive life stages, such as juveniles and reproductively active organisms. Organisms at a sensitive life stages are, in general, more vulnerable to chemical exposures. Providing a nursery for sensitive life stages is a primary function of wetlands (i.e., providing a nursery) for a multitude of fish and wildlife species (Mitsch and Gosselink, 1993). Aquatic species residing in the vicinity of the Tulalip Landfill include salmon, cutthroat trout, and aquatic invertebrates such as clams, mussels, shrimp, and juvenile Dungeness crab (NOAA, 1991 and Weston, 1992). Terrestrial species utilizing estuarine wetlands in the vicinity of Tulalip Landfill include shorebirds and waterfowl, marsh hawks, osprey, bald eagles, and small mammals. The plant species in the area such as cattail, bulrush, and sedges provide shelter, feeding, and nesting areas for many of these wildlife species. These plants also serve as a detrital (dead) food source for aquatic invertebrates (Mitsch and Gosselink, 1993).

Marine AWQCs are appropriate numbers for direct comparison to leachate and groundwater data. The Washington State Department of Ecology recommends that surface waters with salinities greater than 10 ppt be compared to marine AWQC, and that surface waters with salinities between 1 and 10 ppt are to be compared to the most conservative of the freshwater or marine criterion" **32**. The salinity around the Tulalip Landfill are between 5 and 22 ppt, depending on the tide. Review of available biological survey data (Weston, 1992; NOAA, 1991) indicate that marine organisms inhabit the areas surrounding the Tulalip Landfill. The presence of marine organisms is of primary importance in the selection of meaningful water quality criteria. The marine organisms observed near the site are likely the primary receptors for off-site contaminant migration. As such, use of marine criteria for evaluating potential toxicity to these organisms is the most relevant and appropriate, and protective, approach.

The Respondents' request to conduct additional aquatic survey work at the Site was the subject of a formal dispute process under the RI/FS Administrative Order on Consent (AOC). See Response to Comment 2.10.4 for more information regarding this dispute. In summary, EPA's final determination, which was issued pursuant to the AOC, regarding this issue is that sufficient aquatic surveys have already been conducted in the vicinity of the Tulalip Landfill. Additional aquatic survey work is not necessary. For more information refer to the following documents which are included in the AR for this interim ROD:

1. Preliminary Natural Resource Survey, Tulalip Landfill, Marysville, WA, National Oceanic and Atmospheric Administration, 1991 (NOAA, 1991); and

2. Draft Preliminary Site Assessment of the Tulalip Landfill, Letter from R. Henry to D. Charters, September 8, 1992 (Weston, 1992).

A few of the species noted in the above documents are summarized in the first paragraph of this response.

32 Personal communication between Mark Hicks, Washington Department of Ecology and Nancy Musgrove, Roy F Weston, Inc. on January 10, 95.

11.72 Comment: Commentor asked that references be provided to support the use of cattail, bulrush and sedge as a food base for aquatic invertebrates. Commentor asked for a definition of "food base." [3]

Response: EPA has added the requested reference to the final Streamlined Risk Assessment document (Mitch and Gosselink, 1993). The term "food base" has been changed to "food source" to more explicitly indicate that these emergent plants form a detrital (dead) food source ingested by aquatic invertebrates.

11.73 Comment: Commentor stated that small mammals should be included in the list provided on page 4-1. [3]

Response: EPA agrees. Small mammals were added to the list. The reader should note that this list is not a complete listing of all species that have been observed at the landfill. Please refer to Comment 11.71 for more information. Rather, the list provides some examples of species found in the vicinity of the landfill.

11.74 Comment: Commentor stated that additional details regarding the selection of sediment "screening criteria" are not provided in--Appendix A as referenced in Section 4.3.1. [3]

Response: The commentor is mistaken in quoting this section in relation to the selection of sediment screening criteria. There is no mention of Appendix A. However, in the final Streamlined Risk Assessment document, text in Appendix A has been clarified to explain that sediment comparison numbers were discussed in Section 4.

11.75 Comment: Commentor noted that the Apparent Effects Thresholds (AETs) used for benzo(b)fluoranthene and benzo(k)fluoranthene are based on Microtox data, even though the text states that AETs based on Microtox

data would not be used. Commentor also noted that AETs based on amphipods, oyster larvae, and benthic abundance are available for these chemicals. [3]

Response: These numbers were changed in the final version of the Streamlined Risk Assessment document. Microtox data were not used.

11.76 Comment: Commentor noted that freshwater criteria were used instead of marine criteria to evaluate concentrations of lead and mercury in off-source leachate and surface water. [3]

Response: In the final Streamlined Risk Assessment document, the referenced numbers were changed to marine criteria and the evaluation process was repeated. Tables 4-2 and 4-3 in the final Streamlined Risk Assessment reflect any changes resulting from the use of the revised ecological comparison numbers.

11.77 Comment: Commentor asked for a reference for the source of on-source surface water and surface soil data. [3]

Response: On-source surface soil and surface water data (i.e., sample numbers Pl-P5) are from the 1988 E&E report. In addition, leachate seep SP01 is on-source and was sampled during the RI. Leachate seep SP01 had numerous exceedances of AWQC for inorganics such as lead, PCBs such as Aroclor 1016, pesticides such as heptachlor epoxide, and PAHs such as phenanthrene.

11.78 Comment: Commentor offered editorial comments on Table 4-3 of the Risk Assessment and noted that sample R1SBSB01F1 was incorrectly listed as having a vanadium exceedance. [3]

Response: Based on data received digitally from the Respondents, which contains validated data submitted by the Respondents, vanadium was detected in soil at the concentration identified in the report, and exceeded the ecological comparison number. Editorial comments are noted. Table 4-3 has been revised in the final Streamlined Risk Assessment.

11.79 Comment: Commentor noted that although the Risk Assessment stated that data from reference areas were not included, the data was included in the discussion regarding chemical exceedances in off-source surface water. [3]

Response: The commentor has mistakenly concluded that off-source surface water samples were background (reference) samples. The off-source surface water samples referred to by the commentor were taken to evaluate the impact of landfill contaminant discharge on surface water near the site, not as potential reference locations. No reference samples were used in the Streamlined Risk Assessment.

11.80 Comment: Commentor identified references cited in the text which were omitted from the references section. [3]

Response: In the final version of the Streamlined Risk Assessment the reference section is complete.

11.81 Comment: Commentor noted that ecological toxicity values and Toxicity Reference Values (TRVs) do not correspond with the values for acenaphthylene and anthracene in Table A-2 of the Risk Assessment. The body weights and ingestion rates used for converting dietary values to doses was requested. [3]

Response: Information contained in the table referenced by the commentor is correct in the final Streamlined Risk Assessment. The requested justification is provided in the text on pages A-4 and A-5 of the Streamlined Risk Assessment.

11.82 Comment: Commentor noted that the chronic exposure criterion for aldrin is inappropriately labeled as marine when it is actually a freshwater criterion. [3]

Response: The marine and freshwater criterion for aldrin are identical.

11.83 Comment: Commentor stated that the data that exceeded "screening levels" was in part based on comparison to marine aquatic standards even though the surface of the landfill is generally 10 to 14 feet above sea level and high tide. These surface conditions will not support marine organisms. [3]

Response: The surface water on the landfill surface was only compared to freshwater AWQC, not to marine AWQC as the commentor suggests.

Data Use/Interpretation Comments

11.84 Comment: Commentor asserted that the use of unvalidated chemistry data is not appropriate. [3]

Response: All data used in the Streamlined Risk Assessment was validated. The Streamlined Risk Assessment states that EPA did not perform additional quality control on the validated data submitted by the Respondents. EPA, however, reviewed the validation reports submitted by the Respondents. In addition, all split sample data was validated by EPA. For a discussion about the quality of the 1988 data, refer to the Responses to Comments 10.1 - 10.4.

11.85 Comment: Commentors asserted that because on-source surface water data are sufficiently old and were collected during on-site disposal activities with heavy equipment present, that the data may not reflect current conditions at the site. [2] [3]

Response: EPA agrees that surface water data collected in 1988 may not be reflective of current site conditions. Refer to the Responses to Comments 2.9.2 and 2.9.3 for information about how EPA considered the 1988 surface water data.

Regarding the second part of the comment which suggests that the 1988 on-site disposal activities may have contaminated the samples taken in 1988 and therefore, may not be representative of current conditions at the Site, refer to the Response to Comment 11.7.

Subcomments: Several additional concerns with this data were raised.

- Commentor asked if detection limits for this data were evaluated and within risk-based concentration levels.

Response: Detection limits were not evaluated in the Streamlined Risk Assessment. It was not necessary to evaluate detection limits in the Streamlined Risk Assessment because only detected concentrations were compared to criteria. A thorough review of detection limits is provided in Appendix L of the Remedial Investigation report prepared by the Respondents (HLA, 1995).

- Commentor asked what kind of off-source area data was being referred to in the Risk Assessment, and in which year it was collected.

Response: The off-source data that were used are identified in Section 2 of the Streamlined Risk Assessment. This data was collected in 1994 and 1995 during the RI (HLA, 1995) by the Respondents.

- Commentor asked where the data used in the Risk Assessment are summarized?

Response: The off-source data used in the Streamlined Risk Assessment are summarized in Section 4 of the RI report (HLA, 1995) and in Section 2 of the Streamlined Risk Assessment.

- Commentor stated that a summary table is required in Section 2 of the Risk Assessment which identifies the number of samples collected by media, the frequency of detections, the range of detections, and average and maximum concentrations by depth interval.

Response: This information is provided in Section 4 of the RI (HLA, 1995). EPA believes it would be inappropriately redundant to duplicate this information in the Streamlined Risk Assessment.

11.86 Comment: Commentor requested that the citation for data obtained from duplicate samples collected by EPA be provided. [3]

Response: Copies of the validated split sample results are available for public review in Section 3.8 of the AR for the interim ROD.

11.87 Comment: Commentor stated that the draft Risk Assessment did not discuss risk-based detection limits relative to the analytical detection limits. Commentor suggested that this information is important for evaluating the data reliability for Risk Assessment purposes. [3]

Response: A discussion of analyte detection limits is contained in Appendix L of the Remedial Investigation report (HLA, 1995). It was not appropriate to include discussion of detection limits in the Streamlined Risk Assessment because only detected concentrations were compared to criteria. However, lower risk-based detection limits would allow the addition of more contaminants into the evaluation process.

11.88 Comment: Commentor asked why EPA did not use the "$700,000 worth of data collected" by the Respondents in the "screening risk assessment." And, if EPA didn't intend to use it, why EPA required the data to be collected? [1] [2]

Response: See Response to Comment 11.6. The data the commentor is referring to was not used in the Streamlined Risk Assessment because the data was not available at the time the Streamlined Risk Assessment

was being developed. The data was not available because of analytical problems with the data submitted by the Respondents. This data has been corrected to meet Agency standards and the Agency plans to incorporate these data into the ongoing Comprehensive baseline risk assessment. Additionally, some of the data (e.g., bioassays) will need to be quantitatively evaluated using statistical methods, and this type of in-depth evaluation was outside the scope of the Streamlined Risk Assessment, which is a qualitative analysis of risk.

11.89 Comment: Conservative approaches used by EPA have biased the Risk Assessment results. EPA selected chemicals for inclusion in the Risk Assessment that were: (1) only infrequently detected; (2) for concentrations so low that they could only be estimated; and (3) for which standard laboratory and EPA procedures indicated the constituents were not present but for which EPA has decided to presume were present. [3]

Response: EPA believes the results of the Streamlined Risk Assessment are valid and sufficient for decision making purposes with regard to an early, interim containment remedy at the Site. See Responses to Comments 11.26, 11.84 and 11.90.

11.90 Comment: Commentor stated that the use of estimated concentrations conservatively biased the results of the Risk Assessment. [3]

Response: Concentrations that are estimated (J) indicate there is a positive identification of a particular compound, however the "real" value could be either higher or lower than the estimate. Therefore, no conclusion can be made regarding the compounds' conservative or non-conservative bias. Risk assessment guidance states that all "J'd" values should be used in the risk assessment. In addition, these values were validated by the Respondents.

11.91 Comment: Commentor suggested that EPA's draft Risk Assessment inappropriately compared individual and maximum detected concentrations to arbitrarily selected benchmarks and should have calculated the concentration term as the upper 95th percentile of the mean concentration to estimate risk. Commentor also asserted that the Risk Assessment failed to employ proper guidance in determining the actual risk calculations by ignoring average exposure time, average exposure concentrations, and the frequency of detection of contaminants in environmental media. [3]

Response: Contrary to what the commentor has suggested, EPA compared all detected concentrations to comparison numbers (not just the maximum detected concentrations). The purpose of the Streamlined Risk Assessment was to evaluate the frequency and magnitude of exceedances of comparison numbers that are considered to be protective of human health and the environment. For this type of qualitative evaluation, it is not necessary to calculate the upper 95^{th} confidence level of the mean concentration. EPA disagrees that the comparison numbers were arbitrarily chosen - complete justification for the selection and use of the comparison numbers is contained Sections 3 and 4 of the Streamlined Risk Assessment.

The Streamlined Risk Assessment fully complies with CERCLA, the NCP, and EPA presumptive remedy guidance. Risk calculations were not prepared in the Streamlined Risk Assessment. Therefore, the comment that proper guidance was not used in preparing risk calculations is incorrect. EPA included the four steps prescribed in EPA guidance for conducting a risk assessment in the Streamlined Risk Assessment for the Tulalip site. For more information see the second paragraph of the Response to Comment 11.11.

11.92 Comment: Commentor argued that the use of total metals concentrations is inconsistent with EPA guidance. [3]

Response: The issue of the appropriateness of total vs dissolved metal analyses was the subject of a formal dispute under the RI/FS AOC (Gearheard, 1995b; Findley, 1995b). See also Response to Comment 2.11.1 and ROD Section 11.2.1.

EPA agrees with Respondents that the AWQC promulgated by the State, and most recently Federal Water Quality Criteria (FWQC) measure at least some of the water quality criteria using dissolved metals data. However, WAC 173-340-730(7)(c) states "(c)ompliance with surface water cleanup-standards shall be determined by analyses of unfiltered surface water samples, unless it can be demonstrated that a filtered sample provides a more representative measure of surface water quality." Respondents did not demonstrate that this is the case and, based on available information, unfiltered samples provide a more representative measure of surface water quality.

Quantifying total, rather than dissolved, metals concentrations in leachate seeps is the most appropriate approach for assessing overall exposure (via all exposure routes including ingestion and dermal contact) and potential ecological risks to fish and invertebrates residing in the vicinity of the Tulalip Landfill. EPA does not consider the filtered leachate data to adequately characterize all potential risks to these receptors, and thus requires that total metals must be used for assessing such risks. Even though EPA's position is that total metals (as opposed to filtered metals) are the more appropriate concentrations to use

for risk evaluations at this Site, in the final Streamlined Risk Assessment document, both total and dissolved metal concentrations were compared to criteria. Using dissolved metal concentrations, several criteria exceedances were found.

11.93 Comment: Commentor recommended that the frequency and magnitude of exceedances be provided. [3]

Response: This information is provided in the interim ROD in Table 6-2 of the human health evaluation and Tables 6-4 and 6-5 of the ecological evaluation.

11.94 Comment: Commentor requested that the number of samples collected in surface water that measured lead at concentrations exceeding "screening guidelines" be provided. [3]

Response: Streamlined Risk Assessment Table 6-2 of the human health evaluation and Tables 6-4 and 6-5 of the ecological evaluation indicate that lead exceeded ecological comparison numbers in two on-source surface water samples and one off-source surface water sample. The human health evaluation indicated that lead did not exceed the human health comparison number. See Response to Comments 2.10.2 and 11.76.

11.95 Comment: Commentor stated that any discussion regarding the pattern of contaminant migration at the site requires a supporting reference. Further, the commentor stated that the conclusion that the site represents a potential source of exposure and adverse effects to receptors is not supported by specific scientific documentation. [3]

Response: Based on the results of the RI/FS and the Streamlined Risk Assessment, EPA believes the conclusion that the Landfill is a contaminant source is clearly supported, and the potential exposure of humans and environmental receptors to site contamination represents a potential threat to human health and the environment. Contaminant migration at the site is discussed in Sections 4 and 5 of the RI report prepared by Respondents (HLA, 1995). This report documents chemical concentrations detected in groundwater, leachate, and off-source soil and sediment and discusses potential fate and transport mechanisms for detected chemicals. Information in the RI indicates that the highest off-source chemical concentrations are found directly adjacent to the landfill. The RI includes statements such as "(T)he highest concentration of constituents were generally reported in surface soil at the point of leachate seep discharge." (page 6-6). The conclusion that the site represents a source of exposure and potential adverse effects to receptors is supported, at a minimum, by the facts that landfill leachate can be seen discharging from the landfill berm to the surrounding environment, that many of the same chemicals were detected in leachate and off-source media, and that the RI observes a chemical concentration gradient in sediments and soils away from the seeps, and by the magnitude and frequency of criteria exceedances reported in the Streamlined Risk Assessment in all media, including perimeter berm leachate and sediments and soils near the leachate seeps.

11.96 Comment: Commentor stated that there are a number of reasons why elevated concentrations of phenol and 4-methylphenol in surface sediments are not suspected to originate from the landfill. Specific reasons given by the Commentor include the following: [3]

- The chemical concentrations associated with exceedances were, in all cases, higher at the mouths of tidal channels than at the base of the berm where leachate seeps occur. Commentor states that this reverse gradient suggests a source external from the landfill.

Response: It is clear that the landfill is a source of phenol and 4-methylphenol because these compounds were detected in leachate samples. It is possible that additional sources in addition to the landfill exist since phenols can be produced by aerobic degradation of aromatic organics, sewage, and wood wastes. However, EPA has received no information which demonstrates these exceedances are the result of sources other than the landfill. EPA notes that neither phenol nor 4-methylphenol were detected in the surface water surrounding the landfill, but both were detected in the leachate seeps. Therefore, it would be inappropriate to conclude that the origin of these sediment contaminants is a source other than the landfills.

- Both chemicals were found in levels above SMS at background and reference areas, also suggesting a source external to the landfill.

Response: The landfill was determined to be an on-going source of phenol and 4-methylphenol since these compounds were detected in leachate samples. Evaluation of background and reference areas is currently, being performed to determine if they are appropriate for comparison to site results. EPA expects this evaluation will be included in the comprehensive baseline risk assessment.

- The short half-lives of both chemicals indicate that neither of these chemicals can be persistent in the environment without a relatively continuous source of replenishment.

Response: Half-life for phenols has been found to be relatively short in laboratory treatability studies. Based on the results of the RI/FS and the Streamlined Risk Assessment, EPA has concluded that the landfill is

a chronic source of contaminant loading to surrounding areas. The Landfill may be providing a continuous source of these contaminants to the off-source sediments.

- The physiochemical properties of phenol suggest that it would preferentially remain in aqueous phase. To maintain the concentrations observed in sediments, a source of phenol with a significantly higher concentration would be required.

Response: Phenol adsorbs moderately well to sediment, particularly when organic carbon levels are high (such as in the vicinity of the landfill). The leachate seeps provide a source of phenol, and none of the surface water samples taken in the vicinity of the landfill contained phenol; therefore, it seems appropriate to conclude that the phenol observed in off-source sediments originates from the landfill.

- The concentrations found in sediments are not explained by concentrations seen in media associated with the landfill.

Response: The sediment exceedances may be a result of landfill discharges. Modeling of contaminant concentrations across media was not performed as part of the Streamlined Risk Assessment. However, based on the organic carbon partition coefficient (Koc = 2884), one would expect water concentrations of phenol to be 100 times or more lower than sediment concentrations. This is consistent with concentrations observed at leachate seeps.

11.97 Comment: Commentor requested that EPA provide an explanation to support the link of off-source contaminants to on-source contaminants. The commentor stated that all chemicals found in leachate were not found in off-source media, and numerous chemicals found in groundwater and surface water were not found in soil. As an example, the commentor noted that acetone and trichloroethane were found in soil samples but not in groundwater samples. [3]

Response: The Streamlined Risk Assessment states that site data suggests a link between on-source and off-source contamination. As stated in the Streamlined Risk Assessment (page ES-3, 2-4), many of the same contaminants were detected in both leachate exiting the landfill and in the areas adjacent to the landfill, which is evidence that the Landfill is acting as a source of contaminants that migrate to and persist in off-source areas (see Table 5-1 of the interim ROD). Additional information regarding fate and transport of site contamination is provided in Section 5 of the RI report prepared by the Respondents (HLA, 1995). Acetone was detected in Zone 2 groundwater, surface water, and leachate samples. Trichloroethane was not detected in any samples according to the electronic database delivered to EPA by the Respondents.

11.98 Comment: Commentor requested an explanation for possible discrepancies in the data. Specifically, the commentor expressed curiosity regarding why numerous constituents were detected in groundwater and on-source surface water, but were not present in on-source soil. [3]

Response: Information regarding the discrepancies in analytical data, trends in detections, and overall data quality is contained in Appendix L of the Remedial Investigation report (HLA, 1995). Some of the RI data discrepancies were due to matrix interference and elevated detection limits.

Generally, EPA does not require extensive sampling of on-source soils at landfills because on-source soil contamination is not what usually determines the remedy at a landfill. The presumptive remedy guidance for municipal landfills states on page 5 "(s)treamlining the risk assessment of the source area eliminates the need for sampling and analysis to support the calculation of current or potential future risk associated with direct contact" (EPA, 1993a). There was no requirement in the AOC to study on-source soils under the presumptive remedy approach. Therefore, EPA has limited on-source soil data for the Tulalip Site. Due to the limited number of on-source soil samples, the Agency can not draw any conclusions about why many contaminants identified in the groundwater were not found in-the on-source soil.

11.99 Comment: Commentor requested references for statements regarding the depth to groundwater at the different locations around the landfill. [3]

Response: The reference for statements made regarding depth to groundwater is Section 3.6.3, page 3-23 of the Remedial Investigation Report (HLA, 1995).

11.100 Comment: Commentor asserted that more data and scientific justification are needed to explain why it is believed that groundwater is discharging to the leachate and the adjacent sloughs. [3]

Response: Adequate data and scientific justification explaining the connection and relationship of groundwater to leachate and the adjacent sloughs is provided in Section 3.6.4 of the Remedial Investigation report (HLA, 1995) and in the SAC-4 report (Golder, 1995a). Based on EPA's review of the Respondents' work in these documents, the Agency believes that contaminated groundwater within the landfill discharges to the surrounding environment via the perimeter berm leachate seeps and the Zone 2 groundwater. These documents are

included in the AR for the interim ROD.

11.101 Comment: Commentor requested references for the Zone 1 and Zone 2 groundwater data. [3]

Response: Zone 1 and Zone 2 groundwater data was obtained from Section 4.2 of the Remedial Investigation report (HLA, 1995). In summary, 16 volatile organic compounds, 20 semivolatile organic compounds, 2 semivolatile indicator compounds, 3 polycyclic aromatic hydrocarbons, 3 pesticides, and 20 metals were detected in the groundwater samples.

11.102 Comment: Commentor suggested the following additions and amendments: [3]

- Average concentrations, rather than maximum contaminant concentrations, be used for comparison to "screening values."

Response: As stated in the Response to Comment 11.91, all detected concentrations, not just maximum concentrations, were compared to criteria. In effect, this means that minimum, average, and maximum detected concentrations were evaluated.

- "Screening values" are erroneously identified throughout the document as criteria.

Response: As discussed in the Section 1.1, EPA's use of the term criteria and screening has been misleading and EPA used the terms too loosely in the draft Risk Assessment. Consequently, EPA adopted the term "comparison numbers" to better describe the numbers used in the Streamlined Risk Assessment. In compliance with the NCP and EPA guidance, the Streamlined Risk Assessment compares chemical concentrations found in various media (e.g., groundwater; leachate exiting the landfill; surface soil, water, and leachate on the landfill surface; and sediments, and soils adjacent to the landfill) at the Site with comparison numbers. These comparison numbers are established standards and promulgated criteria, and calculated risk-based concentrations, that are generally considered to be protective of human health and environment.

It is true the Region 3 risk-based concentrations that EPA used in the Streamlined Risk Assessment are not technically criteria in the sense that they are enforceable. However, EPA does is not required to use only enforceable criteria to evaluate risk. EPA will use enforceable criteria when evaluating risk if such numbers are available. But when enforceable criteria are not available, EPA will use risk-based concentrations to evaluate risk. See also Response to Comment 11.9.

- The overall range of exceedances of arsenic needs to be provided.

Response: Arsenic concentrations exceeded human health comparison numbers by 1 and 2 orders of magnitude. Ecological exceedances were within one order of magnitude. This information is provided in Figures 6-1 and 6-2, and in Tables 6-2, 6-4 and 6-5 in Section 6 of the interim ROD.

- The presentation of results for the human health is disorganized.

Response: The commentor did not specify how the data appeared to be disorganized so EPA can not respond directly to the commentor's, concern.

11.103 Comment: Commentor contested that phthalates should be caveated because they are ubiquitous in the environment. [3]

Response: Phthalates are ubiquitous in the environment because they are associated with plastics, rubber, and paint coatings. However, phthalates were not caveated because they were also likely components of waste present in the landfill. Phthalate compounds were detected in both on-source groundwater and leachate from the landfill.

It would be inappropriate to infer that because phthalates are ubiquitous, exceedances of comparison numbers for phthalates do not represent a potential risk. Phthalates do not occur naturally in the environment; their ubiquitous nature is a result of anthropogenic sources such as the Tulalip Landfill.

11.104 Comment: Commentor suggested that Table 2-1 of the Risk Assessment appeared to indicate that some chemicals may not have been analyzed in certain media. [3]

Response: The commentor has misinterpreted Table 2-1. As the title of Table 2-1 indicates, the information presented in the table is limited to the name of analytes "detected", not "analyzed" in the media sampled. For a complete listing of analyses performed on these media, the commentor is directed to Section 4 of the Remedial Investigation report (HLA, 1995).

11.105 Comment: Commentor asked whether PCBs or DDT were measured in composite fish tissue samples

collected from on-site tidal channels at concentrations above the detection limits. [3]

Response: As shown in Table 5-1 in the interim ROD, PCBs were detected in fish tissue samples. DDT was not detected in fish tissue samples.

11.106 Comment: Commentor asked if EPA has evaluated what the leachate discharges are today compared to 1980, 1986, and 1991. If so, the commentor asked, what the differences in quality and quantity were. [2]

Response: In its review of the Draft Remedial Investigation report (HLA, 1995), EPA requested that the Respondents conduct the evaluation the commentor has described (Winiecki, 1995b). The Respondents indicated in their response to EPA's comments on the Draft Remedial Investigation report (Flynn, 1995) that "Due to the lack of sufficient historical data, (leachate) trends will not be discussed in the (Remedial Investigation) report." At this time, EPA does not question the validity of the Respondents' conclusion regarding the lack of sufficient historical data. Therefore, EPA has not conducted an independent evaluation of any trends.

The presumptive remedy approach does not require information about the quality and quantity of leachate over time and, therefore, is not needed prior to an EPA decision regarding the need for an early, interim containment action at the Site. It is clear that the Tulalip Landfill is a contaminant source to the surrounding environment.

11.107 Comment: Commentor asked if the surface soil of the landfill is contaminated. [1]

Response: The only soil samples taken on the landfill surface were collected in 1988 during the Site Inspection, and these samples showed detectable levels of several organic chemicals. For a more detailed discussion of chemicals detected in surface soil on the landfill surface, the commentor is directed to the Site Inspection Report for Tulalip Landfill (E&E, 1988), and the Streamlined Risk Assessment. See also Responses to Comments 2.9.2, 2.9.3 and 11.7.

11.108 Comment: Commentor stated that on Table 3-2 of the Risk Assessment, benzo(a)pyrene and mercury are inappropriately identified as detected in samples R1SBSB08Al and RSLSSP02, respectively. [3]

Response: Based on data received digitally from the Respondents, benzo(a)pyrene was detected (and exceeded comparison numbers) in sample RlSBSB08Al, and mercury was detected (and exceeded comparison numbers) in sample R5LSSP02. The comment did not provide any supporting information for its claim that the compounds were inappropriately identified.

11.109 Comment: Commentor requested references for the data collection programs discussed in Section 2.3, entitled Off-Source Data. [3]

Response: These data collection programs are described in detail in Section 2 of the RI (HLA, 1995), which is included in the AR for the interim ROD.

11.110 Comment: The commentor requested the reference for the tissue data collection program cited in Section 2.3.7. of the Streamlined Risk Assessment entitled Fish Tissue. [3]

Response: The fish tissue data was collected as part of the RI at the Tulalip Landfill. The validated data was provided to EPA by the Respondents. A complete listing of this data is contained in Section 4 of the RI (HLA, 1995).

Background Issues

11.111 Comment: Several commentors expressed concern that a comparison of "reference" area concentrations to landfill media was not performed in the Risk Assessment. Arsenic was cited as an example of a contaminant requiring comparison to a reference area concentration. Also, a commentor cited levels of chemicals in fish collected in the reference areas as another example of data that should have been included in the Risk Assessment. [1] [2] [3]

Response: The Streamlined Risk Assessment compared landfill site chemical analysis data to available human health and ecological comparison numbers. This is an acceptable streamlined approach which is consistent with EPA presumptive remedy guidance. The Streamlined Risk Assessment also compared site data to published Washington State background concentrations.

Comparison of site data to reference area data was not performed during the Streamlined Risk Assessment for several reasons relating to the suitability of the sampled reference areas as being representative of background conditions. Bioassay tests on some reference area samples failed (i.e., the test organisms died in excessive numbers), and several organic chemicals including PCBs, pentachlorophenol, 4-methylphenol, and

bis(2-ethylhexyl)phthalate were detected in many reference area samples at elevated concentrations. Data from the remedial investigation is insufficient to determine the origin or cause of the chemical concentrations in the reference areas, given the dynamic nature of the Snohomish River estuary environment and the close proximity of the reference areas to the landfill and other potential contaminant sources. Both the reference areas and the area around the landfill berm are flooded during very high tides and large storm runoff events. Flow reversals in Steamboat and Ebey sloughs adjacent to the landfill that occur due to landward movement of the saltwater wedge could also transport contaminants substantial distances upstream.

Because EPA has not determined the feasibility of using the background data collected in the remedial investigation in time for completion of the Streamlined Risk Assessment, region-specific background concentrations for inorganics in the Puget Sound area were used for comparison in the Streamlined Risk Assessment. These concentrations were developed by the Washington State Department of Ecology (Ecology, 1994) and represent the 90th percentile concentrations for inorganics in soil in the Puget Sound Basin.

In the Streamlined Risk Assessment, site soil data for arsenic, aluminum, beryllium, chromium, copper, lead, manganese, and zinc in soil were all compared to published Washington State background concentrations. Even though the state background level is higher than health risk-based criteria, several exceedances were noted for the landfill site soil using the state background level of 7.3 mg/kg arsenic for soil in the Puget Sound area as a comparison number.

Given these problems with the data collected from sample locations that were intended to be "reference/background" locations, EPA's decision to use region-specific background levels developed by Ecology is a reasonable and appropriate approach which does not compromise the validity of the conclusions in the Streamlined Risk Assessment, nor EPA's conclusions based on the Streamlined Risk Assessment. EPA expects to continue evaluating whether the sample locations intended as background/reference locations sampled are appropriate for use in the comprehensive baseline risk assessment. Extensive statistical evaluation of this data will be conducted during preparation of the comprehensive baseline risk assessment, and feasibility of use will be determined at that time.

Evaluation of background fish tissue values was not part of the Streamlined Risk Assessment, however, it will be done as part of the comprehensive baseline risk assessment.

11.112 Comment: Commentor stated that by not considering available background data or collecting background samples of small mammal tissues, EPA ignored its own guidance for conducting risk assessments. Commentor stated that the Respondents petitioned EPA on more than one occasion to collect additional background data, but that EPA rejected their proposals. According to the commentor, the logic for this rejection cannot be reconciled either technically or based on timing. [3]

Response: EPA disagrees with the commentor. According to the Presumptive Remedy Guidances (EPA, 1990a, 1991, 1993a, and 1995a), EPA does not have to evaluate all potential exposure pathways in a streamlined baseline risk assessment. The Tulalip Landfill Streamlined Risk Assessment followed the Presumptive Remedy Guidances and consequently is sufficient for decision making. EPA is not able to determine which guidance the commentor is referring to since he did not provide a reference with his comment. See Response to Comment 11.16

The Respondents participated in RI scoping and agreed to do the work specified in the resulting RI Work Plan. EPA never prohibited the Respondents from collecting small mammal background data. However, EPA did refuse to modify the approved RI Work Plan because the data was not needed for EPA to perform the streamlined baseline risk assessment and the Respondents request to collect additional data was made too late in the process. See Response to Comment 2.9.

The commentor did not explain why he thought EPA's "logic for this rejection cannot be reconciled either technically or based on timing." Consequently, EPA cannot specifically respond to that part of the above comment.

11.113 Comment: Commentors inquired about or expressed concern about EPA's conclusions regarding patterns of contaminant migration at the site and the relationship of the migration patterns to chemical concentrations in the reference/background areas. [1] [3]

Response: Chemical analysis data provided in the RI (HLA, 1995, Section 4) clearly indicate that many contaminants found inside the landfill (i.e., Zone 1 groundwater and leachate seep data) also occur at their highest concentrations in soil immediately adjacent to the seeps in the wetlands at the-base of the landfill berm. Relatively lower concentrations of these landfill contaminants were found in wetland soil, sediment and surface water at greater distances from the landfill. Some of these same contaminants were also found in the "reference" sample locations.

The leachate seep sample results showed a significantly higher number of detected contaminants than were found in Zone 1 (refuse layer) groundwater, and most of the contaminants were found in higher concentrations

in the seeps than in Zone 1 groundwater samples. Only four monitoring wells are screened within the refuse layer (Zone 1). Because the landfill was constructed as a series of refuse cells separated by internal berms, many landfill cells are not monitored by Zone 1 wells and could contain contaminants not reported for Zone 1 groundwater in the remedial investigation report. Some of these "unmonitored" cells may discharge to some of the seeps, which suggests that the leachate seep data is the most complete available inventory of the contaminants present within the landfill.

As discussed in the Response to Comment 11.95 above, the environment around the landfill is dynamic; gradual concentration gradients of contaminants away from the landfill should not be expected. EPA believes the remedial investigation data clearly shows that contaminants originating from the landfill are migrating off-site and are accumulating in the surrounding wetlands. It remains unclear if the contaminants present in "reference/background" area samples are from the landfill or other sources. EPA will further evaluate this issue in the comprehensive baseline risk assessment.

11.114 Comment: Commentor expressed concern that the Landfill may not be the only contributor of contamination in the vicinity of the site, and wondered what actions EPA will take to eliminate/control other contaminant sources in the area. [1]

Response: EPA agrees that the landfill may not be the only contributor of contamination in the vicinity of the Site. Some of these other potential contamination sources are regulated under other laws. Sewage outfalls, for example, are required to obtain and comply with National Pollution Discharge Elimination System (NPDES) permits under the Clean Water Act. It is outside the scope of the Superfund process to evaluate and regulate all of the possible contaminant sources to the watershed in which a Superfund Site is located. However, by minimizing the contaminant contribution from the Tulalip Landfill to the surrounding areas, EPA expects that implementation of the selected interim remedy will result in reduced exposure of people and ecological receptors to chemicals exceeding comparison numbers at levels that are considered protective of human health and the environment. Contaminant loading due to landfill discharges would also be greatly reduced. Therefore, EPA concludes that implementation of an appropriate remedial action is necessary.

11.115 Comment: Commentor stated that EPA is ignoring its own guidance relating to the concept of "clean islands" by not considering background concentrations in the "screening level" risk assessment. [3]

Response: The commentor did not provide a reference to the guidance to which the comment refers; therefore, the Agency can not respond specifically to the commentor because EPA is not sure what the commentor means by "concept of 'clean islands.-

The remediation of the Tulalip Landfill is required not only because the landfill is contaminated but also because the Site is a source of contamination to off-source areas. The purpose of the remedy selected for the Site is to minimize the continued release of contaminants into the environment from the landfill. EPA evaluated site data collected during the remedial investigation with regional background data in the Streamlined Risk Assessment and found exceedances of background. EPA did not use the site-specific background data collected during the remedial investigation in the Streamlined Risk Assessment because EPA did not have all the background data, e.g., (1) the clam data was not usable and new clam data had to be generated and (2) sediments had to be re-sampled. The site-specific background data will be evaluated in the comprehensive baseline risk assessment. See also Response to Comment 11.88.

Dilution/Mixing Zone Issues

11.116 Comment: Several commentors stated that AWQC were inappropriately applied to leachate in the Risk Assessment because a mixing zone was not allowed. Commentors asserted that surface water collected in the areas adjacent to the landfill has chemical concentrations below marine AWQC, indicating that leachate is sufficiently diluted to prevent a problem. One commentor stated that the concentration of contaminants should be measured in the media in which the receptors live. Commentors stated that it is inappropriate to screen leachate directly against marine AWQC because leachate must mix with surface water to attain the salinity necessary for survival of marine organisms. The commentor further stated that direct exposure of fish to leachate concentrations is not possible. [1] [2] [3]

Response: For the purposes of the Streamlined Risk Assessment, EPA chose to make an appropriately conservative assumption that bottom dwelling organisms residing in areas adjacent to the landfill would be in direct contact with leachate and groundwater. A mixing zone is inappropriate at the Tulalip Landfill because many organisms that EPA believes should be protected at the Site do not live in the water column. Many organisms at the Site, such as amphipods, clams and sculpin, live in or frequently inhabit the sediment and are therefore likely to be directly and regularly exposed to undiluted concentrations of landfill contaminants in leachate or discharging groundwater when there is no "clean" estuarine water available for mixing and dilution because the tide is out. It is appropriate to be relatively conservative in evaluating the risk associated with chemical concentrations in an estuarine environment because not every species and life-stage is accounted for in the AWQC or can be evaluated in a risk assessment.

On February 17, 1995, the Respondents to the 1993 AOC for the conduct of the RI/FS invoked dispute resolution under paragraph 61 of the AOC with respect to a number of issues including the use of mixing zones for measuring compliance with AWQCs. On October 18, 1995, EPA's Region 10 Deputy Regional Administer issued a final determination that concluded that a mixing zone would not be used for measuring compliance with AWQC. (Findley, 1995b; Gearheard, 1995b). EPA's position is consistent with the Washington state regulations that are appropriate for the Site. WAC 173-340-720(6)(d) states that the mixing zone concept cannot be used pursuant to MTCA to determine the point of compliance for leachate contaminated groundwater discharging to surface water. Under the CWA and WAC 173-201A-040(3), the term "surface waters" includes wetlands, tidal channels, and mudflats: the kind of landscape found around the perimeter of the landfill. Results of the RI indicate that leachate is regularly discharging directly onto the wetlands and mudflats that surround the landfill. See also interim ROD Section 11.2.1.

Direct exposure of bottom-dwelling fish such as the staghorn sculpin to leachate chemical concentrations is also possible because sculpin or other bottom-dwelling organisms may receive direct exposure to undiluted leachate during periods of low tide. Sculpin also have a behavioral adaptation of burying into the sediment during periods of low tide that would increase the organisms chance of exposure to undiluted flowing into the sediment.

11.117 Comment: commentor indicated that, to their knowledge, all previous studies were conducted in the main slough near the site and these studies do not reflect on-site conditions. If these surveys are accepted, the commentor requested that EPA allow sufficient dilution for the leachate to reach these distant sloughs and tidal channel locations. [3]

Response: The EPA REAC study (Weston, 1992) evaluated the landfill surface, tidal channels, off-source wetlands, and the sloughs. The Respondents also evaluated the sloughs (Ecology and Environment, 1988). In addition, AOC Respondents seined the tidal channels in the off-source area during the remedial investigation and captured marine and estuarine organisms. A dilution factor is inappropriate because of the reasons stated in the Response to Comment 11.116.

12.0 COMPREHENSIVE BASELINE RISK ASSESSMENT

12.1 Comment: Commentor indicated that statements provided in EPA guidance documents and the preamble to the NCP are not promulgated regulations or laws themselves, and therefore they can't be used to justify not conducting a comprehensive baseline risk assessment, as is required by the NCP language itself. [2]

Response: EPA disagrees with this comment. Refer to the Response to Comment Sections 2.1, 2.2, 2.3 and 2.5.5.

EPA believes that its use of unpromulgated guidance documents to help guide EPA's decision-making process is justified. The purpose of EPA guidance is to provide EPA employees with a tool they can use to ensure that their decision-making processes at Superfund sites are consistent with CERCLA and the NCP. As part of that function, the guidance documents also assist EPA employees with their interpretation of the requirements of CERCLA and the NCP. These guidance documents are written by EPA personnel who are knowledgeable in a particular subject area and who have experience in dealing with issues that arise in that particular area. Thus, EPA believes that the use of guidance by EPA personnel is appropriate to ensure decisions that are made are consistent with CERCLA and the NCP.

12.2 Comment: Commentors stated that a comprehensive baseline risk assessment needs to be performed to establish the need for anything beyond the no-action alternative. Also, a commentor wanted to know if the Comprehensive baseline risk assessment would be conducted and how long it would take. [2]

Response: Refer to the Responses to Comments 2.1, 2.2, and 2.3 for a Response to the first sentence. EPA plans to begin the comprehensive baseline risk assessment in the Winter of 95/96 and expects that the comprehensive baseline risk assessment may take approximately 9 months to complete.

12.3 Comment: Commentors stated that a comprehensive baseline risk assessment which incorporates site-specific information and assumptions should be used to establish the need for remedial actions. [2] [3]

Response: Refer to the Responses to Comments 2.1, 2.2, and 2.3.

12.4 Comment: Commentors stated that the Risk Assessment for interim containment remedy is only a "screening level" risk assessment which substantially overestimates risk, and may in fact estimate risk that does not exist. Commentors stated that only a comprehensive baseline risk assessment estimates risk at the level of detail necessary to make final remedial decisions, and that, until the comprehensive baseline risk assessment is conducted, it is impossible to accurately assess the potential risks at the Tulalip Landfill. [2] [3]

Response: The Streamlined Risk Assessment estimates risk in a reasonable manner in accordance with EPA guidance on risk assessments for presumptive remedies. The Streamlined Risk Assessment is appropriate for the purpose of supporting EPA decision making regarding whether an interim remedial action should be conducted at the Site, and, if so, what the remedial action should be. Many of the ecological comparison numbers used in the Streamlined Risk Assessment are effects-based concentrations values [the value used has a demonstrated negative response in the target receptor(s)]. Additionally, many of the ecological comparison numbers were in the mid-range of the gradient of adverse effects, which provides a more realistic estimation of risk.

The predicted toxicity of contaminants in the leachate seeps and groundwater has been evaluated using standard approaches (comparison with available criteria, standards and risk-based concentrations). In the absence of actual data concerning risk to wildlife or benthos, a reasonable conservative approach was taken.

Existing data from the Tulalip Landfill show clear indications of toxicity from landfill sources. At leachate seeps in particular, DDT and two Aroclors (1016 and 1232) had exceedances of 13 to 49 (DDT), 16 to 40 (Aroclor 1016), and 33 to 194 (Aroclor 1232) times the water ecological quality criterion, respectively. These consistent, high level exceedances underscore the concern that leachate seeps represent an ongoing source that loads these persistent and bioaccumulative contaminants into the surrounding ecosystems. Of similar concern is mercury, which had concentrations in the leachate up to 15 times the water quality criterion. Even though these concentrations are likely to decrease with distance from the seep source, constant loadings could maintain the presence of these compounds in the surrounding media.

Without uptake data based on receptors present in the wetlands and sloughs, or detailed information on fate and transport, the linkage between landfill discharges and long-term loading that will affect environmental receptors can only be estimated. What has been clearly demonstrated, however, is that the landfill discharges contain contaminants in relatively high concentrations (i.e., exceeding water quality criteria) that are known to bioaccumulate and persist. In addition, these contaminants appear to be widespread at the landfill. For example, DDT and PCBs were found at numerous leachate sources (7 of 11 sources and 11 of 11 sources, respectively) at concentrations exceeding ecological water quality comparison numbers and present an ongoing pervasive threat to the nearby receptors.

12.5 Comment: Commentor asked if additional risk assessment information would be made available before the selection of the remedy. [l]

Response: EPA plans to begin the comprehensive baseline risk assessment in the Winter of 95/96. The comprehensive baseline risk assessment will be used in the selection of the final off-source remedy at the Site. However, the comprehensive baseline risk assessment will not be completed before the ROD for the interim remedial action at the Tulalip Site is issued.

12.6 Comment: Commentor stated that the Risk Assessment should discuss risk-based reporting limits and exceedances thereof, and, in particular should discuss how chemicals exceeding risk-based detection limits were handled in the Risk Assessment. [3]

Response: It was not necessary to include discussions of risk-based reporting limits in the Streamlined Risk Assessment because only detected concentrations were used in the analysis. Undetected chemicals were not included in the Streamlined Risk Assessment. EPA believes this to be an appropriate and acceptable approach for a streamlined risk evaluation at this Site.

13.0 SELECTION OF PRESUMPTIVE REMEDY/REMEDIAL ALTERNATIVES

13.1 Comment: The commentor supports the preferred remedy (Alternative 4c) because the remedy fulfills the requirements of the NCP. The remedy achieves protection of health and the environment; complies with ARARs; is a proven technology; and is a cost-effective way to achieve statutory requirements of CERCLA, and the RAOs. other alternatives may have lower capital or O&M costs, but they do not meet threshold requirements of CERCLA and the NCP (e.g., they are not protective of health and the environment, do not comply with ARARs). The commentor prefers the selected remedy because the remedy also achieves substantial risk reduction, is the least expensive remedy in the long-term, and will significantly reduce migration of hazardous substances into marine waters. The commentor stated that the selected remedy is the most implementable remedy. While the commentor generally supports EPA's analysis of alternatives, they believe EPA under-emphasized the true performance and benefits of the capping alternatives (e.g., the cap prevents leachate production which is clearly preferable to treating leachate). The commentor also supports the low-permeability cap to stop the generation and flow of contaminated leachate. Using the Respondents own modeling efforts, the 4c alternative will result in a greater than 99% reduction in the generation of leachate. Prevention of the generation of leachate is preferable to alternatives that do not include a low permeability cap.

The commentor expressed doubt that the treatment berm (Alternative 2a) would perform as well as the party

that proposed it has stated. The commentor indicated that the "treatment berm alternative" proposed by the PRPs was flawed and the "Terminal 91 analogy is clearly false". In addition, the commentor stated that Dr. Greg Richardson, consultant for the Tulalip Tribes, indicated that the Terminal 91 solution was dilution (an unacceptable solution). He further stated that the treatment berm alternative does not address elimination of contaminant pathways (plant uptake, direct human exposure, methane gas release) that occur on the surface of the landfill. The commentor stated that he submitted extensive comments on August 17, 1995 regarding the use of a treatment berm remedy. The commentor opposes the treatment berm (Alternative 2a) because: the filter design will not function and the approach is based on a dilution strategy which does not mitigate environmental loading of landfill contaminates; and the trenching technique may increase risk to the environment. The commentor has concerns about both short and long-term performance of the treatment berm. The commentor asserted that data that has been submitted in support of the treatment berm is not applicable to the Tulalip Site because the Terminal 91 Site is different from Tulalip. In addition, the commentor states that the treatment berm alternative is not as cost-effective as EPA's selected remedy.

In summary the commentor, stated that EPA's proposed interim remedial action is the most direct method and least expensive viable remedial action alternative to dramatically reducing leachate generation at the landfill. Furthermore, the commentor stated that Tulalip Landfill is ideally suited for the presumptive containment solution developed by EPA. [10]

Response: Comment noted.

13.2 Comment: Commentors expressed support for EPA.'s preferred alternative, 4c, Geosynthetic Cover with Passive Drainage, as being the only remedial alternative that will protect the estuary. The commentor opposes the No Action alternative and the hydraulic collection system alternative (identified as 2b in the Proposed Plan). Commentors stated that they do not believe that the hydraulic collection system will function over the long haul. Also the commentor concluded that the system appears to be an elaborate dilution technique and that dilution is not the "solution to pollution." [7] [11]

Response: EPA agrees with the commentor that the No Action Alternative and the 2b alternative are not viable remedial alternatives for the Tulalip Site. EPA only includes a No Action alternative in the Feasibility Study and Proposed Plan for purposes of comparison with other alternatives. EPA is also concerned with the potential long term viability of Alternative 2b. EPA has a number of concerns with Alternative 2b, including that the system will clog and require continual maintenance at yet undetermined costs. The party that proposed the 2b alternative did not submit to EPA persuasive information indicating that the proposed "treatment berm" would indeed treat leachate, as opposed to simply diluting out the contaminants in the leachate to undetectable levels and then releasing the contaminants into the environment. EPA is concerned that dilution would allow continued environmental loading of the contaminants in the wetlands and sloughs surrounding the Site.

13.3 Comment: The commentor conducted a complete review of the RI/FS Report and agrees with its conclusions. The commentor states that it is imperative to stop the leaking of hazardous substances permanently and completely. [7] [16]

Response: Comment noted.

13.4 Comment: Commentor asked how long it will take to construct the preferred Alternative 4c. [1]

Response: Remedial design and construction is expected to take about 2 years.

13.5 Comment: Commentor asked how long it will take before leachate seeps associated will the landfill are eliminated. [1]

Response: According to the feasibility study, implementing Alternative 4c would effectively eliminate rainfall infiltration **33** and reduce leachate generation, thereby eliminating seep groundwater discharges. Discharges of most leachate through the seeps would be expected to diminish in as few as two years.

33 EPA notes that all low-permeability covers develop leaks over time, so infiltration will never be completely eliminated. However, with proper construction design, materials, techniques, quality assurance, and operation and maintenance, the number of leaks are minimized.

13.6 Comment: Commentor asked how long the Alternative 4c cap is expected to last. [1]

Response: Landfill caps that have a geosysthetic component have been in use for the past two decades, and have become the standard in landfill closures. The longevity of the geosynthetic material can be predicted using an accelerated aging test, during which the material is subjected to intense temperatures, high stress, and various liquids. The studies indicate that geosynthetics can last almost indefinitely, assuming proper maintenance and that all the components of the cap are properly installed.

13.7 Comment: Commentor stated that the Tulalip Tribes support option 4c, and expressed concerns regarding option 2b because it is an unproved technology and would require more monitoring than 4c. The commentor further indicated that, in his opinion, the comprehensive baseline risk assessment will do nothing but further delay what the Tribe has been seeking for the past 25 years, which is to have the site capped. The commentor states that food fish and wildlife are in direct contact with contaminants from the site and are consumed by members of the Tribe. [2]

Response: Comment noted.

13.8 Comment: Commentor indicated that leachate is the primary risk that EPA has characterized. Commentor suggests that eliminating leachate generation is the preferred approach to control site risks and suggests that a low permeability cap is the standard solution to eliminating leachate. The commentor was opposed to the leachate collection and treatment approach due to high operating costs. Commentor stated that alternative 4c is the least costly alternative that would be protective of the environment and comply with NCP criteria. [2]

Response: Comment noted.

13.9 Comment: Commentor suggested that a low-permeability cap is the common-sense technology for landfills in western Washington. The commentor indicated that he was unaware of any landfills west of the Cascade Mountains that contain similar wastes and were closed without the use of a low-permeability cap. This, the commentor stated, is because landfills west of the Cascades receive high levels of precipitation. It is the opinion of the commentor that the use of a low-permeability cap is the most logical and applicable remedy. [2]

Response: Comment noted.

13.10 Comment: The commentor ideally would like the site capped with an impermeable cap and a leachate collection system. The commentor felt the leachate collection system was necessary in case of cap failure or catastrophic precipitation events. In the event of insufficient funding, the commentor thought the EPA selected remedy would be protective. [7]

Response: EPA concedes that installing a low-permeability cover at the Site, in conjunction with a leachate collection system, would be more protective than the selected Alternative 4c, which only includes a low-permeability cover. Alternative 5 would be more protective, especially if the leachate collection system was constructed prior to the cover, because the leachate collection system would likely stop the ongoing flow of leachate through the perimeter berm within one year. However, in EPA's view, Alternative 5 is not as cost-effective as Alternative 4c because the incremental environmental benefit of the leachate collection system is not justified by its increased cost. The reason for this is that the groundwater modeling conducted by the Respondents during the RI/FS indicates that the selected Alternative 4c, will cause the leachate seeps to essentially "dry up" within 2 years of construction completion, by cutting off the infiltration of surface water into the landfill which feeds the seeps. The cost difference between Alternative 4c and Alternative 5 is approximately $3.2 million. EPA does not believe it is cost-effective to pay $3.2 million to install a leachate collection system that may become unnecessary within 2 years. A better approach is to install the low-permeability cover required by 4 and wait and see whether the leachate stops flowing in 2 years as expected. If it keeps flowing, at unacceptable levels, a leachate perimeter collection system could be added in the future.

13.11 Comment: The commentor supports the leachate collection and treatment alternative rather than the EPA selected alternative of capping the Site. The commentor concludes that the data does not warrant a cap and that all available data should be analyzed. Also the commentor states that objections to leachate collection and treatment system such as lack of waste containment could be addressed by the use of institutional controls. [12]

Response: EPA believes a cap for the site is preferable to a leachate collection system because a cap prevents the generation of leachate while a leachate collection system only collects leachate which then must be transported off site for treatment. EPA has concluded that alternatives 2b and 2b(ii) do not meet the two threshold criteria: overall protection of human health and the environment, and compliance with ARARs. See Section 9.0 - Summary of Comparative Analysis of Alternatives in the interim ROD. See also

Appendix A in the interim ROD. EPA has identified a number of uncertainties regarding the leachate collection system proposed by Respondents, specifically Alternative 2b(ii). See Appendix E for a more detailed assessment by EPA of Alternative 2b(ii). See also Memorandum, Eric Winiecki to The File, August 4, 1995, re: EPA Review of Alternative 2b - Treatment Berm" in the AR for this interim ROD (Winiecki, 1995d).

EPA has determined that the data from the RI/FS, including the Streamlined Risk Assessment, indicates that a containment response is necessary for the Tulalip Site. For details, refer to the Responses to Comments 2.16 and 13.13. EPA conducted an analysis of alternatives using the nine criteria specified in the NCP and determined that the least expensive alternative that would meet EPA's threshold criteria was Alternative 4c - the landfill cap. EPA has eliminated the leachate collection and treatment system proposed by the Respondents because of serious concerns that EPA has regarding the effectiveness and implementability of the system (in addition to the system failing to meet the NCP threshold criteria). The use of institutional controls will not address EPA's effectiveness and implementability concerns. The commentor did not identify specific institutional controls, so EPA can only speculate on what the commentor may have been referring to in his comment. Institutional controls (such as access restrictions due to fences) would perhaps mitigate human contact with the surface of the soil but would not control the flow of contaminated leachate into the neighboring wetlands, nor would they prevent wildlife from entering the landfill.

An EPA guidance for selecting remedial actions, "A Guide to Selecting Superfund Remedial Actions" (EPA, 1990b) states on page 1 "(i)nstitutional controls are most useful as a supplement to engineering controls for short- and long-term management. Institutional controls (e.g., deed restrictions, prohibitions of well construction) are important in controlling exposures during remedial action implementation and as a supplement to long-term engineering controls. Institutional controls alone should not substitute for more active measures (treatment or containment) unless such active measures are found to be impracticable." Because institutional controls have a very limited value in mitigating risks of concern at the Tulalip Site, EPA directed the Respondents to eliminate institutional controls as a stand-alone alternative during development of the SAC FS. The Respondents subsequently initiated a formal dispute resolution process under the AOC regarding institutional controls as a stand-alone alternative. EPA later issued a final determination, in accordance with the AOC, which found that EPA had "provided a reasonable basis" for its position and that "this position (was) consistent with EPA's discretion, under CERCLA, the NCP, and the agreements made in the AOC."

13.12 Comment: Even the Tribes' consultant, Dr. Gregory Richardson, says that the less costly leachate collection and treatment remedy would perform as well and provide the same level of protection more quickly. [6] [8]

Response: EPA is unaware of any statements or documents made by Dr. Richardson that states "that the less costly leachate collection and treatment remedy would perform as well and provide the same level of protection more quickly." The commentor did not provide a reference to statement allegedly made by Dr. Richardson's, therefore, EPA cannot respond specifically.

A review letter from Dr. Richardson was submitted with public comments from The Tulalip Tribes on October 20, 1995. In that letter Dr. Richardson states "I feel that the proposed interim remedial action proposed by EPA is the most direct method to dramatically reduce future leachate generation at the Tulalip Landfill. Additionally, the proposed remedial action is the least expensive of viable remedial action alternatives in my opinion. The Tulalip site is ideally suited for the presumptive containment solution developed by EPA."

Dr. Richardson also clearly stated on several occasions while making his oral comments during the October 3, 1995 Tulalip landfill public meeting that "providing a cap, preventing the generation of leachate, has always been much less expensive than the treatment of leachate and collection of leachate" (Northwest Court Reporters,
1995)

13.13 Comment: Commentor stated that the proposed Alternative 2b would achieve remedial action objectives sooner than Alternative 4c. [2]

Response: EPA's evaluation of whether a remedial alternative is expected to meet the cleanup objectives for a remedial action is an important consideration under the NCP threshold evaluation criterion: "Overall Protection of Human Health and the Environment." The Remedial Action Objectives (RAOs) that EPA has identified for this interim action are described in the interim ROD in Section 7.0 - Cleanup Objectives for the Interim Remedial Action. Based on the results of the RI/FS, the findings in the Streamlined Risk Assessment, and public comments received during the public comment period, and further EPA review and re-evaluation of all the alternatives under consideration, EPA has concluded that Alternatives 2b and 2b(ii) may not meet, or do not meet, all of the Remedial Action objectives (RAOs)**34** EPA believes there is considerable uncertainty regarding whether Alternative 2b and 2b(ii) would meet the following RAOs:

- Zone 1 Leachate: Eliminate migration of leachate that exceeds potential surface water ARARs from, through, and/or under the source area berm.

  Alternative 2b may not meet potential surface water ARARs at the face of the proposed "treatment berms" if the berms are not effective.

  EPA has expressed concern that there was insufficient justification to conclude that the leachate collection system proposed for Alternative 2b would meet the RAO to eliminate the leachate seeps35. EPA indicated that additional information would be needed to support the Respondents' claim that Alternative 2b would eliminate the migration of leachate that exceeds surface water ARARs from, through, and/or under the source area berm. EPA also expressed concern about the implementability and long-term effectiveness of the Alternative 2b system. The Respondents' subsequent submittal of Alternative 2b(ii) to EPA, which employs a similar collection system, does not provide the requested justification.

  In contrast, groundwater modeling conducted by the Respondents during the FS (Golder, 1995a) suggests that the selected alternative, 4c, would be expected to attain this RAO within two years. EPA considers the groundwater modeling results for the cover alternatives to be more certain because landfill covers are a proven technology with known effectiveness. Implementation of Alternative 4c, would attain this RAO by reducing the Zone 1 leachate mound, causing the perimeter berm leachate seeps to cease flowing within 2 years of construction completion.

34 See Memorandum, Keith Pine of Weston to Eric Winiecki of EPA, February 6, 1996, in the AR for this interim ROD.

35 See EPA's comments on Alternative 2b, transmitted in a letter from Eric Winiecki of EPA to Anthony Burgess, Golder, August 3, 1995, in the AR for the interim ROD.

- Zone 2 groundwater: Minimize migration of contaminated groundwater at levels exceeding background concentrations or surface water ARARs, whichever is less stringent, and prevent use of contaminated groundwater.

  Alternatives 2b and 2b(ii) may not meet surface water ARARs at the sloughs if the unproven collection systems are not effective.

  In addition, according to the Respondents, predictions based on groundwater modeling, it is clear that the selected alternative would minimize the migration of contaminated ground water to a significantly greater extent over the long term. See Response to Comment 2.10.1.

  In contrast, the Respondents' groundwater modeling shows that Alternative 4c is expected to effectively stem the migration of leachate from the landfill over the long term. Alternative 4c performs significantly better than Alternatives 2b and 2b(ii) in this regard after about the first 5 years based on predicted annual leachate flux (Golder, 1995b, Figure 4-1) **36**.

- Landfill gas: Prevent inhalation and release of landfill gas exceeding ambient air standards established by the Puget Sound Air Pollution Control Authority (PSAPCA), and manage the gas to prevent stress on a cap system.

  Alternatives 2b and 2b(ii) would not ensure that the first part of this RAO would be met. In general, gas production within landfills can stress vegetation growing on or near the site, result in a potential threat to public safety, or create an odor nuisance. Landfill gas is potentially explosive at certain concentrations, and usually contains hazardous substances. PSAPCA regulations provide requirements for allowable gas emission rates, air emissions detrimental to persons or property, and odor and nuisance control measures.

  Current landfill emission of methane gas at the Tulalip Landfill is estimated to be 228,000,000 cubic feet per year (HLA, 1994). The current rate of gas production at the Site may be suppressed because much of the waste is within the Zone 1 leachate mound, and therefore much of the waste is saturated, which would be expected to impede waste decomposition which produces landfill gas.

36 For the convenience of the reader, Figure 4-1 is included in Attachment B of this Responsiveness Summary.

However, if the leachate mound in Zone 1 were lowered as a result of installing the collection systems proposed for Alternatives 2b or 2b(ii), the rate of landfill gas production could substantially increase as more of the waste becomes unsaturated and begins to decompose. Thus, while implementation of Alternatives 2b or 2b(ii) could create or worsen a landfill gas problem at the Site, these alternatives do not provide for the possible need for gas collection and treatment.

EPA expects that Alternative 4c, which includes a landfill gas collection system and a contingent gas treatment system, would ensure that this RAO will be met.

Alternatives 2b and 2b(ii) would not meet the RAO to:

- Minimize infiltration: Minimize infiltration into the landfill wastes and resulting contaminant leaching to groundwater.

  Alternatives 2b and 2b(ii) would collect a portion of the landfill leachate after it is generated, but would not prevent contaminant leaching to groundwater by minimizing the infiltration of precipitation into the landfill. Alternative 4c would meet this RAO by minimizing infiltration into the landfill, thereby effectively preventing the generation of new leachate.

Alternative 2b would not meet the following RAO:

- Wetlands: Minimize loss of off-source wetlands, and mitigate for any destruction of or damage to, off-source wetlands from the remedial action.

  Because Alternative 2b would require the dredging and filling of more off-source wetlands than other alternatives (in order to construct the treatment berms), Alternative 2b would not likely meet this RAO. There are other viable remedial alternatives, including 4c, that would require the destruction of a lesser amount of off-source wetlands.**37**

Because Alternatives 2b and 2b(ii) would not, or may not, meet the RAOs discussed above. These alternatives also may not meet the RAO for:

- Future Land Use: Provide final surface conditions suitable for all season subsistence (i.e., hunting and fishing), recreational, and light industrial and commercial use).

For additional information regarding the remedial alternatives and the RAOs, see interim ROD Section 7.0 - Cleanup Objectives for the Interim Remedial Action, and Section 9.0 - Summary of the Comparative Analysis of Alternatives.

13.14 Comment: Commentor made several points comparing Alternative 2b to Alternative 4c: [2] [17]

a. Alternative 2b provides better short-term effectiveness and is approximately one-half the cost of Alternative 4c.

Response: With regard to short-term effectiveness, EPA notes that the potential effectiveness of Alternatives 2b and 2b(ii) is uncertain because their collection systems are unproven. According to the results of groundwater modeling conducted by the Respondents, Alternative 2b and 2b(ii) allow the continued migration of leachate into the Zone 2 aquifer. In the first ten years of operation, approximately 115 million gallons of leachate would be discharged into the environment (Golder, 1995b, Figure 4-2). This volume optimistically assumes the trench system would continue to function without clogging or other disruptions (EPA believes clogging would likely occur). Moreover, the volume of leachate discharging for Alternative 2b would remain at approximately 8 million gallons per year**38** in perpetuity, whereas leachate would virtually cease after 12 years following the installation of the cap as intended under Alternative 4c Golder, 1995b, Figure 4-1). Clearly, Alternative 4c is more effective at minimizing leachate migration in the long term, and the NCP gives preference to long-term effectiveness over short-term effectiveness (Section 300.430(f)(1)(ii)(E) of the NCP). The effectiveness of Alternative 4c is much more certain because low-permeability covers are a proven standard landfill containment technology.

37 (Alternative 2b(ii) may meet this RAO if the proposed holding tank is not constructed in the off-source wetlands).

38 (Golder, 1995b, Figure 4-2)

With regard to cost, EPA believes the relative costs of Alternatives 2b, 2b(ii) and 4c are comparable. Given the unproven nature and the uncertainties associated with Alternatives 2b and 2b(ii), EPA believes the Respondents have significantly underestimated the potential costs of Alternatives 2b and 2b(ii). Therefore, EPA has independently prepared cost estimates for these alternatives based on more realistic assumptions **39**. EPA's cost estimate for Alternative 4c is also different than the Respondents' estimate because EPA incorporated a contingency for landfill gas treatment:

Respondents Cost Estimate (in millions)	EPA Cost Estimate (in millions)	Alternative
		2b - Leachate Collection with Discharge to Treatment Berm
$13.3	$21.3	
		2b(ii) - Leachate Collection with Discharge to POTW
$11.8	$20.8	
$22.4	$25.1	4c - Geosynthetic Cover with Passive Drainage

Using EPA's more realistic cost estimates for Alternatives 2b, 2b(ii), and 4c, it is apparent that the costs of these alternatives are relatively comparable. The cost estimate for Alternative 4c is less than 20% higher than the cost estimate for the Alternative 2b(ii), the least expensive of the three alternatives.

39 For information on why EPA believes these cost estimates are more realistic, see interim ROD Section 11.3 - Cost Effectiveness.

b. Alternative 2b removes current leachate, while Alternative 4c allows it to migrate to the environment.

Response: After about the first 5 years of operation, Alternative 4c allows less leachate per year to migrate into Zone 2 (Golder, 1995b, Figure 4-1). The NCP states that long-term effectiveness is more important than short-term effectiveness 40 C.F.R. 300.430(f)(1) (ii)(E). Over the long term, Alternative 4c much more effectively minimizes leachate generation and migration to a significantly greater extent than either 2b or 2b(ii).

c. Alternative 2b results in less cumulative leachate release for the next ten years than Alternative 4c.

Response: The cumulative leachate released into the marine environment is initially (in the first 10 years of operation) less under Alternatives 2b or 2b(ii) than for Alternative 4c if the untried leachate collection system works as well as the Respondents have predicted. However, over the long term, the cumulative leachate production is substantially greater for Alternatives 2b and 2b(ii). According to estimates provided by the AOC Respondents (Golder, 1995b), the cumulative leachate flow out of the landfill into the environment for the leachate interception scenario will surpass the cumulative leachate flow anticipated from an FML cover in a period of 15 years. Furthermore, after 15 years the annual rate of leachate discharge for Alternative 2b continues to remain at approximately 8 million gallons per year. In contrast, the rate of leachate discharge for Alternative 4c remains at nearly zero after 15 years.

Also, EPA had a number of concerns regarding the use of a POTW as part of Alternative 2b(ii). These concerns include: (1) that the Alternative 2b(ii) system could not be considered to be permanent because of its relatively high O&M costs. The future viability of this Alternative is vulnerable to unforeseen increases in the price of POTW treatment and the cost of power to run the collection system pumps; (2) the uncertainty about whether the POTW treatment systems are capable of effectively treating all the contaminants of concern in the leachate; and (3) delays that could result from administrative difficulties-with obtaining permits and access from construction of the proposed sewer line to the POTW. Access would need to be obtained to construct the pipe across at least one private property parcel and the pipe would also need to cross the Burlington Northern railroad tracks and a highway.

d. Alternative 2b provides treatment of landfill constituents and does not impact wetlands; Alternative 4c does not treat landfill constituents and will impact wetlands.

Response: Alternative 2b would require the destruction of a significant amount of off-source wetlands to allow construction of the treatment berms. Some incidental impact to wetlands would be expected during the construction of Alternative 4c. See also Response to Comment 13.13.

Regarding treatment of landfill contaminants, EPA questions whether the "treatment berms" proposed for Alternative 2b would actually provide treatment of landfill contaminants, or merely dilute them before

releasing them to the surrounding environment. Alternative 2b(ii) would likely provide adequate treatment of leachate. Although Alternative 4c is a containment remedy that does not include an active treatment system, some reduction of the toxicity of the landfill waste under Alternative 4c would be expected to occur as a result of biodegradation within landfill waste. Biodegradation in landfills is a process by which the solid organic particles are solubilized and converted to methane gas and carbon dioxide gas, which are typically vented or flared. In addition, Alternative 4c is expected to eliminate leachate production and contaminant loading to the off-source areas. As such, it will effectively "contain" the landfill wastes such that active treatment of the wastes is not required (or cost-effective).

13.15 Comment: Commentor asked whether incineration and disposal of the on-site waste had been considered. [1]

Response: Based on EPA's experience with remediation of landfills like the Tulalip Landfill, EPA has found that incineration as a remedy for source control of contamination is impracticable and expensive. EPA has found that containment remedies that effectively prevent contact with landfill wastes and prevent landfill contaminants from migrating to other areas are less expensive, and are generally protective of human health and the environment.

When EPA developed its presumptive remedy guidance for municipal landfills, the Agency reviewed remedies selected and implemented at 30 landfills around the country. EPA found that incineration was routinely eliminated from remedy selection because of cost. For more information refer to EPA's presumptive remedy guidances (EPA, 1990a, 1991, 1993a, and 1995a) and the AR for the Tulalip Site.

13.16 Comment: Commentor asked if Alternative 2b, the treatment berm, were capable of achieving the degree of treatment that it projected, would it be considered an acceptable alternative. [1]

Response: EPA believes that it would be difficult or impossible to determine whether treatment was occurring within the proposed treatment berms or whether the leachate was simply being diluted. To determine whether treatment was occurring, and to what degree, a rather long-term comprehensive evaluation system would be required. EPA would have to negotiate the terms, conditions, and costs of the evaluation with the parties responsible for remediation of the Site. EPA expects that this would be a rather lengthy process.

EPA also anticipates that the evaluation process itself would be of a long duration. The time that would be required to negotiate, implement, monitor, and interpret the result of such an evaluation system are a concern to EPA because it may take years before EPA could assess whether a reliable remedy had been implemented at the Site. If the remedy failed, then an impermeable cover, such as that described for Alternative 4c, would have to be installed on the landfill as a contingency. The interim remedy selected by EPA in this interim ROD, which includes a cap, has a long history of implementability and effectiveness -- neither of which has been demonstrated for the treatment berm system. To date, the Respondents have not submitted information which adequately supports the implementability or effectiveness of the treatment berm system. Implementability and effectiveness are two of the nine criteria used by EPA to evaluate alternatives.

See Responses to Comments 13.13 and 13.14 for more information about EPA's concerns regarding the reliability and effectiveness of Alternative 2b.

13.17 Comment: Commentor suggested that additional fill (demolition debris) could be imported to achieve the desired slope and that limestone could be used to adjust the leachate pH, which would reduce migration of contaminants. [2]

Response: EPA may consider the use of demolition debris as fill. However, the Agency has engineering and toxicity concerns regarding the use of demolition debris as fill at the Tulalip Site. Before accepting a specific source of demolition debris, the Agency would need information that addresses EPA's specific engineering and toxicity concerns. EPA would assess the information before agreeing to accept a specific source of demolition debris. EPA would want to be sure that the debris under consideration would not contribute contamination to the Site.

Exposure of the landfill leachate to limestone would likely increase the pH of the leachate, making it more basic. As a result of raising the pH of the leachate, one would expect metals to precipitate out of solution. However, phenolic compounds, which have been detected in landfill leachate, tend to become more soluble under more basic conditions, so EPA believes it is unlikely that limestone would provide effective treatment for these types of contaminants. Limestone may not be effective at treating other contaminants of concern, such as pesticides or PCBs. Therefore, EPA does not consider the use of limestone to be a viable long-term treatment solution because it would not substantially reduce migration of all leachate contaminants, even in the short-term.

13.18 Comment: Commentor stated that the No Action Alternative (1), and Alternatives 2, 2b, 3, 4a, and 4b fail to meet the fundamental threshold requirements of CERCLA. [2]

Response: Comment noted.

13.19 Comment: Commentor stated that many different caps are currently available in addition to a FML cover. The commentor suggested that a geosynthetic clay liner (GCL) tolerates more damage, is more easily repaired, is a natural product, and can cost less. [2]

Response: EPA agrees geosynthetic clay liners (GCLs) can provide a viable alternative to FMLs. The interim ROD provides for either a minimum 50 mil FML or a GCL to be used as the low permeability layer in the Tulalip cover design (see ROD Section 10.1.3 - Landfill Cover System).

As pointed out by the commentor, GCLs have the capacity to "self heal" if punctured. However, GCLs are relatively new to the industry, and have not undergone extensive testing as FML have. In addition, GCLs can be slightly more expensive to install than FMLs (approximately $0.50 per square foot for GCLs versus approximately $0.40 per square foot for FMLs).

13.20 Comment: Commentor stated that there is not enough information available to conclude that the long-term maintenance costs associated with impervious caps and caps with flexible membrane liners are negligible. [2]

Response: Some of the flexible membrane liners (FMLs) have been in use for two decades. This use has enabled engineers to develop some conclusions regarding maintenance requirements and costs. For the Tulalip Landfill, anticipated operation and maintenance (O&M) costs are estimated to be about $170,000 per year for the selected alternative (Golder, 1995b.) When evaluated over a 30-year period using present worth value analysis and assuming a 5% discount rate, this long-term maintenance cost amounts to $2.6 million.

This cost is comparatively lower than other alternatives that were evaluated. For instance, the EPA estimates that Alternative 2b would cost an estimated $465,250 per year (with a present worth cost of over $7 million in 30 years). Operation and Maintenance costs for other alternatives provided in the "Feasibility Study for Source Area Containment (SAC-4)" (Golder, 199Sa) and "Comparison of the Leachate Collection and Treatment alternative (2b) with the FML Cover Alternative (4c), Feasibility Study for Source Area Containment (SAC-4)" (Golder, 1995b) include the following:

ALTERNATIVES	ANNUAL O&M	PRESENT WORTH O&M*
Alternative 2 (Active Seep Interception)	$220,000	$3,400,000
Alternative 2b (ii) Leachate Collection and Treatment	$386,000	5,900,000
Alternative 3 (Seep and Zone 2 Controls)	$620,000	$9,600,000
Alternative 5 (Cover, Seep Controls)	$220,000	$3,400,000
Alternative 6 (Cover, Seep, Zone 2 Controls)	$280,000	$4,300,000

* Calculated over 30 years with a 5% a discount rate. O&M costs for contingent landfill gas treatment are not included because it is not certain that gas collection and treatment will be necessary. **40**

40 EPA notes that the need for continued operations and maintenance (O&M)could exceed 30 years.

The relatively lower O&M costs predicted for Alternative 4c are largely due to the passive and self-contained nature of engineered caps.

13.21 Comment: Commentor stated that EPA's preferred Alternative 4c, the FML cover, is significantly more expensive than and provides minimal additional benefit over proposed Alternative 2b, Alternative Collection and Treatment. [2]

Response: EPA disagrees. Alternative 4c meets the nine NCP criteria and Alternatives 2b and 2b(ii) do not. Alternative 4c is cost-effective and is not significantly more expensive than Alternatives 2b and 2b(ii), see ROD Section 11.3 - Cost Effectiveness and Response to Comments 13.14. Alternative 4c provides significant additional benefits, see ROD Section 9 - Summary of Comparative Analysis of Alternatives and Response to Comments 13.13.

13.22 Comment: Commentor expressed concern that the $25 million clean-up cost may be grossly underestimated and suggested that the cost could grow as high as $90 million. [l]

Response: The commentor's suggestion that the cost of the selected remedy could grow as high as $90 million is highly unlikely. Both EPA and the Respondents have independently performed cost estimates for the proposed cap (Alternative 4c). EPA has determined that the $25 million cost estimate is within an acceptable range of accuracy (i.e., +50 percent to -30 percent of the final construction cost).

Review of the $25.1 million cost estimate shows that it is very sensitive to changes in imported soil quantity. Current grading plans presented in the "Revised Feasibility Study for Source Area Containment (SAC-4)" (Golder, 1995a) provided an estimate of 637,000 cubic yards of imported fill at a total cost of $6.8 million (import soil and top soil) plus an additional $1.2 million for regrading surface soil and waste. To account for the commentor's estimated cost increase to $90 million, the quantity or cost of fill and regrading would likely need to increase nearly an order of magnitude above current estimates. At this time, there is no reason to believe this may occur. Finally, comparison of actual costs for landfill cap installation has shown that the $25.1 million cost estimate is generally consistent on a per acre basis with other sites of similar magnitude **41**.

13.23 Comment: Commentor suggested that Alternative 4c was selected because it is the most protective and least costly approach. Commentor also stated that the proposed costs of the other alternatives may be overstated, and costs of these alternatives could be lowered with creative use of resources and engineering. [2]

Response: Comment noted.

13.24 Comment: Commentor stated that the Respondents have evaluated Alternative 4c and agreed that it could cost $25 million; however, the cost could increase to $40 million depending on the amount of re-grading and additional fill needed. [3]

Response: The cost estimates that are used in the interim ROD are Feasibility Study (FS)-level cost estimates. In general, EPA expects that actual remedy costs will fall within a range of +50 percent to -30 percent of a FS cost estimate. The main purpose of FS cost estimate is not to estimate the cost of each remedial alternative with precision, but to allow a comparison of the relative costs of the remedial alternatives that are under consideration. Typically, at Superfund Sites, a more accurate cost estimate for the selected alternative would be prepared during the Remedial Design phase of the process, which would usually begin after a remedy is selected in a ROD. In EPA's view, therefore, the commentor's statement that the actual cost of implementing one of the alternatives may significantly exceed the cost estimate is premature.

Nevertheless, based on current information, EPA believes it is unlikely that the actual cost of implementing the selected remedy, Alternative 4c, would grow to $40 million dollars. EPA considers this cost figure to be extreme. Comparison of actual costs for landfill cap installation has shown that the $25 million cost estimate is relatively consistent on a per acre basis with other sites of similar size (see Response to Comment 13.22). At this time, EPA believes that the actual costs of Alternative 4c are equally likely to be lower or higher than the $25 million cost estimate. EPA notes that Dr. Greg Richardson, a technical consultant who has worked for the Respondents and The Tulalip Tribes, stated at the second public meeting that he believed the cost estimates for all of the alternatives may be higher than the actual costs will turn out to be (Northwest Court Reporters, 1995). See also ROD Section 11.3 - Cost-Effectiveness.

41 See Responsiveness Summary Appendix A: EPA Review Comments on the of the Leachate Collection and Treatment Alternative (2B) with the Cover Alternative (4C), Specific Comment Number 17; also interim ROD Section 11.3 - Cost Effectiveness.

13.25 Comment: Commentor suggested that a protective and effective remedy could be implemented (either a partial cap or leachate collection and treatment alternative) for $7.5 to 15 million, which is 30 to 60% less than EPA's approach.[3]

Response: EPA estimates that a more realistic cost for the Alternative 2b(ii) leachate collection and treatment system is $21 million. The Alternative 4c cap is expected to cost from about $22 million to $25 million, depending on whether gas treatment will be necessary. Given that the leachate collection system

has so many uncertainties regarding its constructibility, long-term operation, and effectiveness; from a cost standpoint alone, EPA believes the Alternative 4c cap is a more cost effective remedy.

13.26 Comment: The Tulalip Tribes plan to develop the property, so a cap is redundant anyway because buildings and asphalt can be good covers as long as they are maintained. Why not make this the Tribe's responsibility? [12]

Response: There are other parties in addition to The Tulalip Tribes who are liable for cleanup costs at the Site. These other parties include other parties that operated the Site, transported waste to the Site, or generated waste that was sent to the Site. The Tulalip Section 17 Corporation42 is participating in the allocation process to determine the fair share of response costs to be allocated at the Site (see Responses to Comments 5.1 and 5.2).

EPA selected an impermeable cap with a 2% grade to stop the generation of leachate and to prevent pooling of water on the surface. EPA selected the impermeable cap because it satisfies, better than other alternatives, the criteria by which EPA must evaluate response action alternatives, including ARARs. One ARAR identified for the Site is the Washington State MFS for landfill caps. The MFS specify the design specifications for the construction of caps. For the type of cap required for the Tulalip Site, the placement of buildings and asphalt on the Site as a cap would not meet the design standards specifications in the MFS for the Site. For more details see ROD Section 10.1 - Description of the Selected Remedy.

13.27 Comment: EPA is ignoring its guidelines that match cost-effective cleanups to the intended use of the site. There was no mention of the intended use of the site. [12]

Response: The commentor is incorrect. Future use of the Site is summarized in the Proposed Plan (see pages 7 and 17), and is described in greater detail in the document entitled "Big Flats Land Use Program" (Tulalip Tribes, 1994), which is available in the AR for the interim ROD. Future use is also considered in the ROD as one element of the "Community Acceptance" NCP evaluation criterion (see ROD Section 9.0 - Summary of the Comparative Analysis of Alternatives).

42 The Tulalip Section 17 Corporation leased the Site to the Seattle Disposal Company for landfill operations and was also involved in post-1980 capping operations at the Site.

The interim ROD, Section 10.2 - Integrating the Interim Action with Land Use Plans, states "The selected interim remedy shall allow the on-source area of the Site to be productively used by people, with some restrictions necessary to prevent damage to the interim remedy. To a reasonable and feasible extent, as determined by EPA, the selected interim remedy shall be designed and constructed to allow for the types of future use activities described in the Big Flats Land Use Program" (Tulalip Tribes, 1994). The Tulalip Tribes have identified recreational, light industrial, and commercial uses for the source area of the Site, and traditional hunting and fishing uses for the off-source wetland areas.

EPA has concluded that the selected interim remedy (Alternative 4c) is cost effective (see ROD Section 11.3 - Cost Effectiveness) and is compatible with these future land use objectives. The selected interim remedy is the least expensive alternative that is protective of human health and the environment, and meets all ARARs.

13.28 Comment: Commentor expressed concern that the landfill site will be available for light industrial/commercial use following the implementation of the remedy. The commentor specifically wanted to know what effect on-site development would have on the cap and what landfill sites in the country have experienced similar development following the installation of a landfill containment system. [1]

Response: The selected interim remedy should allow the on-source area of the Site to be productively used by people, with some restrictions necessary to prevent damage to the interim remedy. The selected interim remedy shall be designed and constructed to be compatible with the types of future use activities described in the "Big Flats Land Use Program" (Tulalip Tribes, 1994). This document is available for review in the AR for the interim ROD.

Any activity on the cover beyond normal cover maintenance activities shall be approved in advance by EPA to help ensure that damage to the remedy will not result. The degree of development to occur on the landfill will be dependent on the cap design and other factors. It is feasible, and has been supported by the Respondents, that development could include construction of small structures for commercial or light industrial use without detrimental impact to the cap. Special provisions and restrictions, such as utility and structural foundation placement, would most likely be applicable based on the final cap design. This level of development is consistent with the intention of the Tulalip Tribes as described in the "Big Flats Land Use Program" (Tulalip Tribes, 1994).

EPA **43** plans to conduct a national study of remediated landfills to determine potential uses for such sites:

however, to date the Agency has not routinely compiled data about post-remedial uses of capped landfills. But the Agency is aware that some capped landfills have been used for recreational uses. Examples of some landfill caps which have supported development include a municipal landfill in Riverview, Michigan which features downhill ski runs, a golf course, and several single- and multiple-family homes; and a 50-acre landfill near Cambridge, Massachusetts, which is to be developed with bicycle paths, ball fields, tennis courts, and a running track.

13.29 Comment: Commentor asked how long it will take before light industrial development will be permitted to occur at the site following the implementation of the remedial action. [1]

Response: Development and beneficial use of some portions of the site could begin immediately following the cap construction with further development to occur over a period of time. The Tulalip Tribes' Land Use Program (Tulalip Tribes, 1994) provides a sequence of expected uses on the landfill cover. According to the Plan, light industrial use of the Site is expected to begin 10 years after construction is complete.

13.30 Comment: The commentor believes that the remedial investigation results support the need for remedial action. The commentor supports EPA's selected interim remedial action for the Site. The commentor concurs with the observations in the Proposed Plan regarding the importance of the Snohomish River Delta as an important fish and wildlife habitat. Specifically, the commentor states that the delta areas at risk are critical areas for important ecological functions and are critical habitat to animals. [16]

Response: Comment noted.

43 Personal communication between Lynda Priddy, Environmental Scientist, EPA, Region 10 with Ken Skahn, Office of Emergency and Remedial Response, EPA Headquarters on 2 February 1996.

13.31 Comment: The commentor stated that the remedial action must include and integrate effective fish and wildlife habitat restoration. None of the alternatives identified in the Proposed Plan integrate cleanup with habitat restoration which should be vital to selecting the remedy. The commentor concluded that integrating the remedy and restoration is less costly than treating the issues separately. An integrated strategy maximizes environmental benefits. [11]

Response: The Proposed Plan for Interim Remedial Action at the Tulalip Landfill Superfund Site only addresses remediation of the on-source area of the Site. The on-source area is the area of the landfill itself including the perimeter berms. EPA is presently evaluating data to determine whether and to what extent the off-source area (the surrounding wetlands) have been adversely affected by the landfill and whether additional remediation of the wetlands will be necessary.

The proposed remedy reflects EPA's determination that it is not possible to achieve complete fish and wildlife habitat restoration at this Site through the remedy selected by EPA. The natural resource trustees have been satisfied with EPA's level of coordination and consultation with them in reaching this decision. Although EPA's proposed remedy does not restore lost or damaged resources, the natural resource trustees for the Site have identified a project to acquire and protect from development property in the vicinity of the landfill which represents the equivalent resources that have been damaged or lost due to the release of hazardous substances at the landfill. The natural resource trustees for the Site will work with EPA to determine whether additional restoration activities will be required to restore lost or damaged off-site natural resources.

EPA offered the de minimis parties an opportunity to settle their natural resource damages liability as part of the de minimis settlement for the remediation of the Tulalip Landfill Site. As of February 16, 1996, approximately 80% of the de minimis parties have signed up for the natural resource damages settlement, contributing approximately $660,000.

13.32 Comment: Commentor stated that approximately 17 inches of precipitation may run off of the cap, if installed. In light of this, the commentor asked if anyone had evaluated the effects of such conditions on juvenile salmon utilizing wetlands associated with the landfill. [2]

Response: EPA requested that the Respondents conduct such an evaluation in the feasibility study for source area containment. The Respondents replied that such an evaluation should be done during remedial design and that it was premature to evaluate this type of effect of a remedy during the RI/FS. Design changes can be made during remedial design to address potential problems.

13.33 Comment: Commentor stated that the proposed remedy has the potential to significantly impact the wetlands and estuarine tidal channels surrounding the landfill, resulting in a violation of EPA's "no net loss of wetland" policy. Commentor stated that EPA has not adequately evaluated the potential impacts of the proposed remedy because it has neither required, nor allowed the types of studies needed to evaluate these

impacts. [2] [3]

Response: Although implementation of the selected remedy, Alternative 4c, will change the hydraulics of the surrounding wetlands (for example, the selected alternative is expected to result in the elimination of landfill leachate seeping through the perimeter berm onto the surrounding wetlands within two years), EPA believes that the benefits of greatly reducing contaminant migration from the landfill will likely offset any potential harm to the off-source wetlands due to altered hydraulics. If the off-source wetlands are harmed as a result of the selected interim remedial action, the damaged wetlands would need to be restored, mitigated, or replaced.

Wetlands systems are extremely complex. In EPA's view, it would be very difficult to design a study that could assess potential changes in the wetlands that would be expected to result from hydraulic changes due to implementation of the selected remedial action. Conducting such a study would likely be expensive, time intensive, and the results may be of questionable value.

EPA has determined that the most appropriate way to remediate the Site is in phases. Thus, the source area will be remediated and, as stated above, the remedial measures taken on the source area are expected to result in a benefit to the surrounding wetlands through a reduction of leachate flow to the surrounding wetlands. The second phase of the remediation includes completing the comprehensive baseline risk assessment for the off-source area to determine the extent of contamination and appropriate response measures for the off-source area. Additionally, the natural resource trustees for the Site have identified a project to acquire and protect from development property in the vicinity of the landfill which represents the equivalent resources that have been damaged or lost due to the release of hazardous substances at the landfill. The natural resource trustees for the Site will work with EPA to determine whether additional restoration activities will be required to restore lost or damaged off-site natural resources. All of these measures combined are likely to result in a determination and implementation of the appropriate response measures to be taken on the surrounding wetlands.

13.34 Comment: The Commentor expressed the concern that none of the proposed remedial alternatives will be effective in the wetland areas of the site. Consequently, they request that the selected remedial alternative eliminate any potential threats to human and environmental health. [4]

Response: EPA believes that the selected remedy will effectively halt the generation of leachate after the cap has been installed. The volume of leachate already in the landfill will decrease and within about 2 years cease discharging from the landfill through the perimeter berm into the wetland. Therefore, future contamination of the wetland area is expected to stop.

To assess the present condition of the wetland or off-source area, EPA will be conducting a comprehensive baseline risk assessment on the wetland area around the source-area. Based on the results of that comprehensive baseline risk assessment, EPA will determine whether additional remedial work is needed to protect/restore the wetland. EPA will request public comment on the Proposed Plan for the off-source area. The Proposed Plan will specify remedial action, if any, necessary for the off-source or wetland area surrounding the Landfill.

13.35 Comment: Commentor asked if any of the existing landfill is considered wetlands and if so, if the landfill closure will require a permit from the Army Corps of Engineers. [1]

Response: An evaluation of the landfill surface and surrounding areas is being conducted by EPA to determine the approximate size and type of any wetland areas. EPA expects that this habitat assessment will be completed in the spring of 1996. Pursuant to CERCLA Section 121, EPA is not required to obtain a permit for remedial activities at a Superfund site.

Wetlands species have begun to establish themselves on parts of the landfill surface. For purposes of the selected interim remedy, the source area on the landfill will fall under section 402 of the CWA, which is administered by EPA, rather than Section 404, which is administered by the Corps. See Section 11.2 - Compliance with ARARs, for more information. See Response to Comment 13.31.

13.36 Comment: The Tulalip site is in an estuarine environment which should not only call for but require a broader range of alternatives than are applicable to typical upland landfills on which the presumptive remedy is based. [3]

Response: At some point in the RI/FS process, EPA has given full consideration to every interim remedial containment alternative that has been suggested by the Respondents. EPA delayed issuing the Proposed Plan in order to fully evaluate Alternative 2b, which the Respondents submitted to EPA after the Source Area Containment FS was completed. EPA also solicited additional input during the public comment period on the Proposed Plan.

EPA notes that the "treatment berm" concept proposed as part of Alternative 2b is not a technology that is at all suitable to a "typical upland landfill." The treatment berm concept, as proposed by the Respondents depends on the presence of tidal waters to mix with leachate within the berms.

13.37 Comment: Commentor asked how long a monitoring program would be conducted before the remedy was considered successful. [4]

Response: An EPA-approved, post-construction monitoring plan will be prepared for the Site. The monitoring plan require data which will be used to evaluate the effectiveness of the remedy and to assess whether the remedy remains protective of human health and the environment. After the first two years of post-construction monitoring are complete, EPA may re-evaluate the frequency of collection of post-monitoring data and of quarterly monitoring reports. See also ROD Section 10.1.5 - Post-Construction Care for additional information.

13.38 Comment: Commentor asked if a monitoring program would continue after the off-source containment area remedy was established. [4]

Response: Monitoring may be required after a ROD is issued for the off-source remedy. At this time it is unknown what monitoring needs there may be for the off-source areas. EPA expects to establish monitoring requirements for the off-source area in the final ROD.

13.39 Comment: Commentor asked who will be responsible for maintenance repair work (e.g., the gas collection treatment system) of the landfill. [4]

Response: It is not known at this time who will be responsible for operations and maintenance (O&M) of the selected interim remedy. This would depend on the results of future negotiations EPA expects to conduct with the PRPs, the Tulalip Tribes, and other parties, regarding construction of the selected interim remedy and other issues. O&M responsibilities would likely be part of these negotiations.

13.40 Comment: Commentor asked what actions EPA will take to resolve further contaminant migration issues if the remedy fails to meet established success criteria. [4]

Response: See Response to Comment 13.37. If, as a result of site monitoring, EPA concludes that the interim remedial action is unsuccessful at containing the landfill wastes, additional containment actions, such as construction of a perimeter leachate collection system, may be necessary.

13.41 Comment: Commentor asked how the condensate associated with the gas collection treatment system operations would be handled. [4]

Response: Details regarding the handling of landfill gas collection system condensate are normally determined during remedial design.

13.42 Comment: Commentor asked whether the cap would require additional maintenance if differential settlement occurs at the Site and whether the $25 million cost estimate takes this into consideration. [l]

Response: The O&M at the Tulalip Landfill site would include repairing any damage that may occur due to differential settlement. Anticipated expenditures for this type of O&M activities have been factored into the cap's cost estimate.

13.43 Comment: Since EPA only required leachate controls when the Agency approved the reopening of the Tulalip Site, then EPA should only require these same controls when they are closing the site. [12]

Response: EPA evaluated the use of several leachate collection systems in its evaluation of remedial alternatives in the Tulalip Landfill Feasibility Study. In EPA's evaluation of remedial alternatives in the FS, the Agency concluded that leachate collection systems alone as a remedial solution would not be protective of human health and the environment or meet ARARs identified for the site. The Agency has serious concerns about construction and operation of certain types of leachate collection systems.

Regulatory controls dictated by regulations in the past (such as controls that may have been state-of-the-art or regulatory requirements at the time the landfill was open) that are now known to be ineffective in protecting human health and the environment are not appropriate remedies. EPA must make its decisions consistent with good science and existing regulations which are based on knowledge and technology which have advanced since the early 1980's. EPA screened out for consideration remedial alternatives clearly would not meet the remedial response objectives identified for the Site and which did not meet the other criteria EPA must consider in selecting a remedy. Given that EPA had concluded that leachate systems alone could not address human health and environmental concerns identified at the Site, EPA selected another remedial alternative that would address the migration of contaminated leachate from the site and exposure to

landfill contents.

Leachate seep control alternatives 2, 2b, and 2b(ii) would allow continued migration of contaminated Zone 2 groundwater to the sloughs, and would not prevent contact with landfill contaminants. These alternatives may not meet the RAO to prevent inhalation and release of landfill gas that exceeds ambient air standards. The seep control alternatives may not meet surface water ARARs where Zone 2 groundwater discharges to the sloughs or, in the case of Alternative 2b, at the face of the treatment berm if the berm is not effective. Alternatives 2, 2b, and 2b(ii) do not comply with MFS because they do not include a landfill cover. Alternative 2b may not meet Section 404(b) of the Clean Water Act because it requires dredging and filling of off-source wetlands, and there are protective, ARAR-compliant alternatives (i.e., the selected interim remedy) that would require the destruction of significantly less off-source wetlands. The leachate collection system alternatives 2b and 2b(ii) carry significant risk of failure, including the potential for clogging and other problems, and therefore may not be protective in the long term. For more information on seep control versus landfill cover alternatives see Section 9.0--Summary of the Comparative Analysis of Alternatives, in the ROD for interim remedial action. See also Responses to Comments 2.12.1 and 2.12.2.

13.44 Comment: Commentor wanted to know why an interim remedy was warranted for the site given the letter drafted by Bill Glasser, RPM, U.S. EPA, in 1992, stating that there were no imminent or acute threats to human health or the environment posed by the site. Commentor wanted to know what had changed at the site between the time the letter was drafted and now. [2]

Response: See Response to Comment 2.8.2. The document the commentor is apparently referring to is not a letter (Glasser, 1992). It is a "removal assessment."

13.45 Comment: Commentor stated that the observation of ponded water on the landfill at various times of the year indicates that the cover presently out there is not highly permeable, as suggested by EPA. [2]

Response: Ponded water on the surface of the landfill may be caused by the Zone 1 water table intersecting the landfill surface in some areas and by perched water (leachate or rainwater) over poorly draining surface soils in other areas. For example, leachate seep SP-01 in the eastern portion of the landfill is a location where the Zone 1 water table intersects the landfill surface, resulting in a leachate seep and an area of ponded leachate alongside the landfill access road. In other areas, there may be some areas of less permeable surface soils. However, water levels in the refuse layer vary by as much as 3 feet with the highest water levels measured during the rainy winter months and the lowest water levels measured during the summer. The seasonal variation in water levels clearly shows that rainfall infiltrating through the relatively porous surface soil is the primary source of groundwater recharge to the refuse layer. This observation is further supported by the relative absence of surface water runoff pathways from the landfill surface to the surrounding wetlands.

EPA notes that permeability is relative. For example, sand is highly permeable relative to clay, but gravel is highly permeable relative to sand.

13.46 Comment: Commentor stated that it has not currently been shown that migration of leachate into groundwater and into surface water poses an unacceptable risk. Therefore, the need to actually decrease migration of leachate into groundwater has not been fully established. [2]

Response: The number and magnitude of comparison number exceedances by chemicals in leachate, as identified in the Final Tulalip Landfill Risk Assessment for Interim Remedial Action (Weston, 1995b) is sufficient justification to state that leachate poses a potential threat to human health and the environment. This potential threat justifies the need for action. This action includes containment, including control of the leachate. See Response to Comment 2.10.1.

13.47 Comment: Commentor stated that EPA shouldn't rush ahead with a presumptive remedy but should instead take plenty of time and thoroughly explore all of the available alternatives. [2]

Response: At some time during the RI/FS process, EPA has carefully evaluated all of the interim remedy options that the Respondents have proposed. EPA has evaluated 11 interim remedial action alternatives in the interim ROD, including a No Action alternative, alternatives that do and do not include a landfill cover, and alternatives that are proven and unproven technologies for containing and treating landfill wastes. At every Superfund Site, EPA must weigh the benefits of obtaining additional data or conducting additional evaluations against the benefits of expeditiously proceeding with selection and implementation of a response action, if appropriate, to address potential threats to human health and the environment posed by a Site. The NCP states that EPA should consider this weighing process with a "bias for action" (see Response to Comment 2.5.4). In the case of Tulalip Landfill, at this time, EPA believes that a sufficient number and range of interim containment alternatives have been evaluated, that there is sufficient information regarding potential risks to conclude that the Site represents a potential threat to human health and the environment, and that, based on the evaluation of alternatives required by the NCP, Alternative 4c is the most appropriate

alternative to implement as an early/interim remedial action.

13.48 Comment: Commentor argued that the zero-sloped trench throughout the landfill will immediately fail and that such an alternative will be impossible to "back-flush". [2]

Response: EPA shares the commentor's concerns with Alternative 2b and 2b(ii). EPA anticipates that clogging of the leachate collection system pipes and drainage media with biological solids and inorganic precipitates would be a severe and costly maintenance problem that would be further compounded by the proposed zero-slope trench design.

In addition, EPA notes that clogging of the pipe and drainage media may be difficult to detect. To ensure proper functioning, such a collection system would require periodic maintenance to prevent an unscheduled or unintended interruption. Furthermore, replacement of the drainage system, including piping, drainage media, and pumps would likely be required during the course of its operation.

13.49 Comment: Commentor stated that the presumptive remedy should not be, by default, an impervious cap. Commentor suggested that the Tulalip Landfill should not be considered a typical landfill in Western Washington given the physical features of the area and its location in an estuary. [2]

Response: The presumptive remedy for the Tulalip Landfill is containment, not an impervious cap. The Respondents evaluated many containment alternatives in the feasibility study for source area containment (Golder, 1995a) including various combinations of permeable soil covers, relatively impermeable caps, leachate interception, leachate containment by vertical barriers, and groundwater containment by vertical barriers. EPA has thoroughly considered and evaluated all of the alternatives proposed by the Respondents and has solicited public comment during the 80-day public comment period on the Proposed Plan.

13.50 Comment: Commentor asked if lateral or tidally influenced flow of groundwater was present through on-site waste, and if so, how the current recommended action would prevent horizontal contaminated groundwater flow from influencing zone 1 and 2 groundwater. [4]

Response: See Response to Comment 9.1

13.51 Comment: Commentor asked what criteria would be used to evaluate the source area containment remedy. [4]

Response: The nine evaluation criteria contained in the National Contingency Plan (NCP) have been used to evaluate the source area containment remedy alternatives (see ROD Section 9 - Summary of Comparative Analysis of Alternatives).

13.52 Comment: Commentor asked what the areal extent of surface soil contamination is, and if the contamination associated with the surface soil is the vehicle driving the preferred capping remedy. [l]

Response: The extent of surface soil contamination, as it relates to exceedances of human health and ecological-protective criteria, is identified in the Final Tulalip Landfill Risk Assessment for Interim Remedial Action (Weston, 1995b).

Surface soil contamination is not the major reason for taking remedial action at the Site. The need for interim remedial action is driven by numerous exceedances of health-based comparison numbers and biological effects-based comparison numbers in landfill leachate discharging to the wetlands, groundwater discharging to surface water, wetland soil around the perimeter of the landfill, and surface water and sediment in the tidal channels surrounding the landfill. However, the primary reason for the remedial action at the Site is the exceedances of effects-based comparison numbers in the leachate.

13.53 Comment: Commentor asked if EPA has evaluated trends in contaminant concentrations at other un-capped landfills with similar leachate problems. [1]

Response: The Agency has not studied trends in contaminant concentrations in leachate from either covered or uncovered landfills **44**.

44 Personal communication between Lynda Priddy, Environmental Scientist, EPA, Region 10 and Ken Skahn (contact in EPA Headquarters for Superfund municipal landfill presumptive remedies), Environmental Engineer, Office of Emergency and Remedial Response, Environmental Protection Agency on 2 February 1996.

13.54 Comment: Commentor suggested that the proposed Interim Action is not consistent with EPA's regulatory guidance. The commentor explained that EPA defines the reasons for taking an interim action as "the need to take quick action to protect human health and the environment from an imminent threat in the short-term while a final remediation solution is being developed." It is the opinion of the commentor that because no "imminent hazard" is clearly defined and agreed upon at this site that the use of an interim remedy is a misapplication. [2]

Response: EPA's "Guidance on Preparing Superfund Decision Documents". (OSWER Directive 9355.3-02, July 1989, page 9-11), states that EPA may determine that it is appropriate to implement an interim action at a site. The guidance states that interim actions "which may be removal or remedial actions, can be taken to respond to an immediate site threat or to take advantage of an opportunity to significantly reduce risk quickly."

EPA's designation of the remedy selected in the ROD as an interim action is appropriate and consistent with EPA guidance. Data gathered at the Site during the RI/FS confirm that an immediate threat to human health and environment exists at the landfill. Based on the results of the RI and the Risk Assessment, EPA has concluded that the Site may pose an imminent and substantial endangerment to human health and the environment. This finding suggests that it is appropriate for EPA to take action in the form of an interim action to contain discharges at the Site in a prompt and effective manner. An emergency situation requiring immediate response is not necessary in order for EPA to implement an interim remedy. EPA has other mechanisms, such as removal actions, which may be used in emergency situations. EPA believes that it is appropriate to institute an interim remedy at the source area of the landfill rather than to allow the leachate to continue to be generated and released into the environment unabated until a final remedy which addresses site-wide environmental problems can be selected and implemented.

EPA's Guidance further states that "interim actions are limited in scope and are followed by other operable units that complete the steps to provide definitive protection of human health and the environment for the long-term." Consistent with this statement in the Guidance, the PRPs, pursuant to an AOC, have conducted studies of the source area of the landfill and the information gathered has provided an adequate basis on which to evaluate risks and alternatives for remediation for the source area. A complete evaluation of the off-source area of the Site has not been completed and it is premature to determine the appropriate response action to be taken for the off-source area. Thus, EPA determined, given the documented existence of hazardous substances on the source area which pose a risk to human health and the environment, that it would be prudent and appropriate to address those threats through the use of an interim remedy and to address off-source threats through a final remedy.

13.55 Comment: Commentor indicated that a cap is standard practice for a landfill. [2]

Response: Comment noted.

13.56 Comment: Commentor stated that a zero-infiltration cover over the landfill is not required, and that a certain amount of infiltration can be tolerated while still eliminating seeps. [2]

Response: There is no such thing as a "zero-infiltration cover," because all cover systems develop leaks over time. However, groundwater modeling conducted by the Respondents during the FS suggests that the perimeter berm leachate seeps may be eliminated if infiltration into the landfill can be reduced from its current level of 17.1 inches per year to approximately 0.07 inches per year (Golder, 1995c, Appendix A, page A-2, Section A.3 and page A-4, Section A.5). This infiltration reduction is achievable only with a cap with a low permeability layer consisting of an FML, or with a cap that has a low permeability layer such as a GCL with a maximum permeability of 1 x 10-9 centimeters per second. Alternative 4a, for example, which is a soil cover, would not achieve the required infiltration reductions.

13.57 Comment: Commentor stated that in rare instances the treatment of leachate can be cost-effective. However, as a rule, preventing and minimizing leachate is far less costly than treating leachate. [2]

Response: In general, EPA agrees that in most cases, it is more cost effective to prevent and minimize leachate than to treat it. This is the main reason that remedies for landfills like the Tulalip Landfill are almost always containment remedies that include a low permeability cover. Operation and maintenance (O&M) costs for collection and treatment of leachate at the Tulalip Landfill site are considerably higher than O&M costs associated with preventing formation of the leachate. When considering long term operation, the relatively higher cumulative O&M costs for leachate treatment tend to offset any savings gained from the relatively lower capital costs associated with construction of leachate treatment systems.

13.58 Comment: Commentor stated that EPA Region 10 has determined that the surface of the landfill is contaminated based on data from one leachate seep on the surface of the landfill. Commentor further stated that this area represents less than one-quarter of one acre of the 143 acre landfill surface, or less than 0.2% of the surface area. Commentor argued that this data is insufficient to justify a capping remedy. [3]

Response: EPA based the decision for interim remedial action and selected a containment remedy, including a cover, for the Tulalip Site based on the Agency's concern for contaminant migration via leachate from the on-source area of the Site to the off-source area of the Site. The reason the surface of a landfill is covered is primarily based on the need to eliminate leachate generation over the long-term in a reliable and effective manner, not to prevent exposure of people and environmental receptors to surface or subsurface soils. See Response to Comment 11.23.

The EPA presumptive remedy guidance "Presumptive Remedy for CERCLA Municipal Landfill Sites," page 5 (EPA, 1993), states "(s)treamlining the risk assessment of the source area eliminates the need for sampling and analysis to support the calculation of current or potential future risk associated with direct contact." The Agency has found in its experience with landfill remediation that surface and subsurface soil data play a small role in the data used to select a remedy. Therefore, for the Tulalip Site, the Agency did not focus on gathering subsurface soil data or additional surface soil data beyond what was already available.

EPA disagrees that EPA "determined that the surface of the landfill is contaminated based on one leachate seep on the surface of the landfill." See Response to Comments 2.9.2, 2.9.3 and 11.7 for a discussion of EPA's evaluation of the landfill surface.

14.0 MICROBIOLOGICAL STUDIES

14.1 Comment: Commentor stated that the microorganism research at the site does not support the conclusion of human health risks from microorganisms leaching from the landfill. For example, the commentor claims the microbiological data presented in Appendix C of the Risk Assessment document do not suggest that microorganisms pose risks at the landfill. [3]

Response: EPA presented microbial data from samples taken over a period of twenty years at and around the Tulalip Site. Based on that data, EPA concluded in the Streamlined Risk Assessment for the Site that "microbial contamination at the site may pose a potential health risk to humans." However, in EPA's microbial analysis, the Agency did not attempt to "conclusively" link the microbial contamination in off-source matrices to the landfill. EPA has not, nor will the Agency claim, that the microbial data represents a "microbial risk assessment." At most, the Agency observes that some risk may occur from exposure to matrices that are contaminated. It is not within the scope of the RI/FS investigation and review at the Tulalip site to assess the degree of risk that may result from exposure to microbial organisms at the Tulalip site. There are no pathogen risk-based concentrations on which to perform such an analysis. EPA's purpose in mentioning a potential risk from exposure to these microbial organisms is to note that data is available to suggest a potential risk.

However, EPA believes that with the installation of a cover over the landfill that over time the microbial population of concern will decrease. The population is expected to decrease as the leachate seeps dry up, thus eliminating the transport of microorganisms from the landfill through the leachate seeps into the environment surrounding the landfill.

14.2 Comment: Commentor expressed the opinion that the data presented in a memo prepared by Mr. Dean Boening of ICF (3/17/95) lacked any clear description of a sampling plan, including sampling plan objectives; sampling locations; and methods of sample collection, handling, transport, and laboratory analysis. The commentor also did not understand the rationale for selecting the three indicator groups and five species of bacteria included in the study. The commentor suggested that the chosen organisms were useful in determining the presence of human fecal coliform contamination and the potential for transmission of enteric pathogens. [3]

Response: Microbiological investigations followed the Quality Assurance Project Plan for the Site. Sampling locations were determined according to locales selected from earlier investigations that produced elevated levels of microbial contaminants. Leachate samples were collected from characterized leachate seeps. Sample collection, handling, transport, and laboratory analysis was conducted according to:

APHA. 1989. Standard Methods for the Examination of Water and Wastewater, 18th ed. American Public Health Association., Washington, D.C.

Food & Drug Administration Bacteriological Manual, 5th ed. 1984. American Public Health Association., Washington, D.C.

E.P.A. 1978. Microbiological Methods for Monitoring the Environment, Water and Wastes. EPA-600/8-78-017.

The microbial data was collected over a period of 20 years. Therefore, much of the data conforms with the standards and protocols normally associated with collection of the microbial samples. The initial site investigations (in the 1970s) were conducted according to NPDES regulations, which regulated these bacterial indicators. These early investigations preceded the Superfund program. Currently, local, state and federal agencies conducting microbiological monitoring programs also commonly analyze for the indicators (total coliform (TC), fecal coliform (FC) and fecal streptococci (FSc)) identified in the Streamlined Risk Assessment for the Tulalip site. Evaluated populations of TC FC and FSc are considered to be indicative of the presence of pathogenic bacteria. Also, FCs were analyzed for because published standards are available for FCs, making "exceedances" easier to regulate. Infectious microorganisms originating from hospitals (E. coli, C. perfingens, S. aureus and P. aeuruginosa) which could survive at a landfill would mainly be bacteria associated with eye, ear, nose, throat, genitourinary, respiratory, and staph infections. These five bacterial species were of interest because they are common etiologic agents in these infectious episodes.

The above commentor also had the following comments:

a. Several potential significant sources of microorganisms, including antibiotic resistant organisms, are known to exist in the area, including sewage treatment plant wastewaters, dairy farms, septic tanks, wildlife, and urban runoff.

Response: In general, effluent from these practices can be sources of antibiotic resistant bacteria. However, EPA is not aware of any peer-reviewed literature that substantiates the claim that these bacteria are "known to exist in the area" surrounding the landfill.

b. Background and off-site concentrations of microorganisms were similar to on-site concentrations.

Response: The size of a microbial population is not necessarily predictive of the risk of infection from that organism. For example, exposure to a small population of metabolically dormant organisms during the winter months may be just as infective as an exposure to a larger, metabolically active population of the same organism during the spring and summer months. Because microbial agents may replicate in the field, the concept of concentration (e.g., chemical) as an indicator of toxicity is not necessarily considered to be an indicator of infectivity for microbial agents. Opportunistic pathogens may be ubiquitous in an area, but that does not make them less pathogenic.

Also, comparison of on-site population numbers to background or off-site populations numbers (in addition to reasons explained above) may not be indicative of a risk because even an ubiquitous population requires a host to be infective and these organisms are very species-specific. In other words, even if the background, if a host was present at the landfill then infection is possible through direct and indirect contact.

Investigations from 1970 to 1992 show that on-site microbial populations at the Tulalip Site were higher than background or off-site populations. However, sampling in 1992 and 1993 indicated that on-site populations are similar to background and off-site populations. This decrease over the last couple of years does not decrease EPA's concern about the infective potential of these organisms for reasons stated below.

c. A consistent trend of decreasing microorganism concentrations were measured in the area over time.

Response: Generally, the concentration of microbial populations at most upland landfills decrease over time. For example, facultative aerobic bacteria persist up to 10 years in a standard upland landfill. However, conditions at the Tulalip Site (abundant nutrients and oxygen), provides a conductive milieu for most aerobic/facultative populations to persist far beyond this 10 year period. Therefore, EPA believes that the Tulalip Site may be a longer-term source of bacterial indicators than would be generally expected.

d. Standard protocols for testing for antibiotic resistance were not used.

Response: Standard protocols (Kirby-Bauer disk agar diffusion procedure) were followed. This is the protocol used worldwide by clinical and applied microbiologists. The citations are as follows:

Federal Register. 1972. Rules and regulations. Antibiotic susceptibility disks. 37 Fed. Reg-20525-20529 (Erratum: 38;2756, 1973).

National Committee for Clinical Laboratory Standards. 1992. Fourth informational supplement: M 100-S4. Performance standards for antimicrobial susceptibility testing. NCCLS, Villanova, PA.

e. Antibiotic resistance of background and off-site microorganism samples were similar to on-site samples.

Response: EPA agrees. However, the assumption that this statement is based on (resistance patterns of background organisms are "innocuous") may not be true. In other words, these antibiotic resistant strains may or may not have originated from the landfill and migrated into nearby sediments.

Resistance traits are carried on and transferred via extrachromosomal plasmids. These transfers occur among a variety of bacteria, including the fecal coliform family **45**. Exactly how long an environmental bacterium will retain these plasmids is unknown but some authorities have observed that bacteria possessing multiple resistance factors are more hardy and less subject to environmental stress than native strains lacking resistance factor plasmids.**46**

f. The indicators and specific species evaluated are ubiquitous in the environment.

Response: See Response to Comment 14.2(b) above.

g. The presence of antibiotic resistance in any of the organisms does not necessarily qualify them as pathogens.

Response: The expression of antibiotic resistance is unrelated to the classification of a bacterium as a pathogen. The pathogens that have been a concern at the landfill are "opportunistic." That is, these ubiquitous organisms can take advantage of any opportunity to invade a human host either directly or indirectly.

14.3 Comment: The commentor stated that the microbiological study did not evaluate viruses or other agents that could impact human health. Commentor asked if there is concern that such agents may potentially be present. [4]

Response: EPA did not evaluate the possibility that viruses or "other agents" were present at the Tulalip Site. Animal viruses do not "grow" in the environment and would not be expected to survive in the long-term outside of a host, especially while exposed to ambient environmental conditions. EPA assumes that what the commentor means by "other agents" is protozoan agents. EPA's purpose was not to perform a full-fledged microbial risk assessment but to summarize microbial data that was primarily already available from previous investigations conducted over the last twenty years. EPA is not claiming that viruses or "other agents" (apart from the microbiological data) may pose a significant risk, or any risk for that matter, at the Tulalip Site. Similarly, EPA only concluded from the bacterial data that a risk to human health may exist.

45 Kelch, W.J. and J.S. Lee, 1978. Antibiotic Resistence Patterns of Gram-negative Bacteria Isolated from Environmental Sources. Appl.Environmental. Microbiol. 36:450-456.

46 Grabow, W.O.K., I.G. Meddendorff and O.W. Prozesky. 1973. Survival in Maturation Ponds Containing Coliform Bacteria with Transferable Drug Resistance. Wat. Res. 7:1589-1597.

14.4 Comment: Commentor stated that the microbiological data (Appendix C in the Risk Assessment document) are not consistent with the summary presented in Section 2.4 of the document. [3]

Response: Tables 1 through 9 of Appendix C were present in the Draft Final Streamlined Risk Assessment (Weston, 1995a). These Tables were inadvertently left out of the Final Streamlined Risk Assessment (Weston 1995a). No changes were made in the Tables and the information in the Tables was present in the AR (e.g., Draft Final Streamlined Risk Assessment) during the comment period on the Proposed Plan.

14.5 Comment: Commentor stated that the microorganism concentrations reported in the corrected "most probable number" data tables dated January 31, 1994, and presented at the end of Appendix C of the Streamlined Risk Assessment do not correspond to the data presented in EPA's memo dated March 17, 1995. [3]

Response: The data tables from January 31, 1994 and March 17, 1995 do correspond. The January 31, 1994 data tables do not conflict with the data in Tables 1 through 9, but instead augments it. The January 31, 1994 data was inadvertently left out of the data summary presented in Tables 1-9.

15.0 FUTURE SITE STUDIES

15.1 Comment: Commentor asked if other studies are being performed on biota of different trophic levels in the future. If so, the commentor asked if the study would be similar to the study of PCBs and eagles in the Hood Canal area. [4]

Response: EPA is currently working on a comprehensive baseline risk assessment that will include an assessment of the potential impacts of site contaminants on upper trophic levels. This study will be significantly different than the study of PCBs and eagles in the Hood Canal area. The comprehensive baseline risk assessment will use Site data to evaluate potential risk to upper trophic levels using the off-source areas of the Site, such as the Northern Harrier (Marsh Hawk) and the Great Blue Heron, from exposure to Site contaminants, which include but are not limited to PCBs. The Hood Canal study, on the other hand, covered a larger geographical area (the Hood Canal area), but focused more narrowly on a specific species (eagles) and specific contaminants (PCBs).

16.0 MISCELLANEOUS COMMENTS

16.1 Comment: The commentor believes "...the EPA staff, in the science and engineering disciplines, is unqualified to render the decisions that they have put forth." The commentor believes there is a huge disparity between the EPA's staff credentials and those of the PRPs. Consequently, the commentor states that EPA should withdraw the Proposed Plan because: (1) EPA has not completed the baseline risk assessment; (2) EPA staff is not qualified to select the remedial action; (3) the Proposed Plan ignores the language in HR 2099 which is part of EPA's continued funding in HJR 108; (4) the Proposed Plan does not take into account EPA's administrative reforms published on October 2, 1995; (5) the remedy is not consistent with other remedies selected at NPL landfills in Region 10 or the Agency's presumptive remedy AR; and (6) EPA has not responded to the University of Washington's appeal to remove the Site from the NPL. [5]

Response: EPA is confident in the qualifications of its staff and in the individual staff members, competency in conducting the duties which EPA is mandated to perform. Referrals to responses to the above comments, are as follows:

(1) EPA has not completed the baseline risk assessment: See Responses to Comments 2.1, 2.2, and 2.3;

(2) EPA staff is not qualified to select the remedial action: See Response to Comment 16.1;

(3) the Proposed Plan ignores the language in HR 2099 which is part of EPA's continued funding in HJR 108: See Responses to Comments 2.6 and 2.17;

(4) the Proposed Plan does not take into account EPA's administrative reforms published on October 2, 1995: See Response to Comment 2.6;

(5) the remedy is not consistent with other remedies selected at NPL landfills in Region 10 or the Agency's presumptive remedy AR: See Responses to Comments 2.4 and 2.14; and

(6) EPA has not responded to the University of Washington's appeal to remove the Site from the NPL: See Response to Comment 4.1.

ATTACHMENT A

DE-MINIMIS SETTLEMENT ISSUE
AND OTHER LIABILITY COMMENTS

EPA received comments regarding liability issues, primarily about the de minimis settlement, during the public comment period for the Proposed Plan. The public comment period was for the Proposed Plan, EPA's evaluation and selection of a remedy for the Tulalip Landfill. EPA has responded to those comments in the Responsiveness Summary. However, comments about liability issues that were given at the public meeting are addressed, separately, in this attachment because they do not directly relate to the selected remedy for the Site. EPA will respond directly, in writing, to commentors who submitted de minimis liability comments in writing to EPA during the public comment period and were not given at the public meeting.

1.0 Comment: Commentor asked if all de-minimis parties have been contacted, including public bodies, and if they were on both a list and an invoice list. [2]

Response: EPA used several sources to prepare a master list of approximately 6,500 parties associated with the Tulalip Landfill. The sources included Marine Disposal Company logbooks, as well as information supplied by Rubatino Refuse Company and Waste Management, Inc. EPA is offering de minimis settlements to appropriate parties on the master list, including public bodies, who contributed between 0.01 and 0.6 percent of the total waste at the site. The settlement offers are being conducted in three rounds.

Those parties with waste volumes below 0.01% of the total waste volume at the Site are not being offered settlements. These parties have been determined by EPA to be de micromis parties, and consistent with EPA guidances and policy, are not being asked to contribute a portion of the response costs incurred at the Site.

In addition to the master list, EPA has in its possession approximately 28,000 ledger cards supplied by the Seattle Disposal Company. To date, EPA has reviewed this ledger card information for those parties already on the master list and identified as eligible for a de minimis settlement. EPA is initiating a comprehensive review of these ledger cards in order to determine if additional parties, beyond those already identified, are eligible for a de minimis settlement.

2.0 Comment: commentor asked if there was a mechanism in place to return money to the people on the de minimis list if the Tulalip site was taken off of the NPL list. [2]

Response: No. Even in the unlikely event that the Tulalip site is taken off of the NPL, EPA retains its authority to take enforcement action to compel cleanup at the site.

3.0 Comment: Commentor asked if the post-1980 users are being asked to contribute to the settlement. [2]

Response: The Tulalip Section 17 Corporation **47**, U.S. Navy, and other post-1980 users of the site are currently participating in a formal allocation process. The purpose of this process is to determine fair and equitable cleanup cost shares for these and other parties.

4.0 Comment: Commentor asked what action the EPA would take if the de minimis invoice parties did not pay their bill within the 30-day period. [2]

Response: The settlement to de minimis parties is offered in the form of an administrative order on consent (AOC). The AOC provides for each settling party to make a cash payment to the Unites States for a proportionate share of past and future response costs at the site. Payments will be due only after the AOC becomes effective. After receiving binding signature pages from the settling parties, EPA will sign the AOC and it will be made available for public comment. Following the public comment period, the AOC will become effective after the settlement is approved by the United States Department of Justice. EPA will then send notice to each settling party that the AOC is effective. Payments by the settling parties will be due 30 days after receiving notice that the AOC is effective.

47 The Tulalip Section 17 Corporation leased the Site to Seattle Disposal company for landfill operations and was also involved in post-1980 capping at the Site.

EPA will not determine in advance the action it will take to enforce the terms of the AOC against a party who signs the settlement but fails to make the required payment. By signing and returning the AOC signature page to EPA, Settling Parties agree to be bound to the terms of the settlement, which requires each party to submit specified payments within 30 days after receipt of notice of the effective date of AOC. Parties who do not do such, will be considered in violation of the AOC, and subject to enforcement proceedings. As stated in Paragraph 23 of the AOC, pursuant to Section 122(l) of CERCLA, a Settling Party who fails or refuses to comply with a term or condition of the AOC is subject to a civil penalty of up to $25,000 per day of such

failure or refusal. In addition, a party who fails to make the payments will not gain the benefits of a covenant not to sue from the United States, and will not enjoy contribution protections provided settlers under CERCLA.

5.0 Comment: Commentor, identifying himself as a former customer of Rubatino Refuse, asked how it was that EPA determined 516 tons of scrap wood materials were hauled from his property and disposed of at the landfill. Based on the content of the public meeting's proceedings, the commentor expressed that he was not prepared to enter into a de minimis settlement that the EPA requested. The commentor is not convinced the liability to those participating will be eliminated because leachate may continue to migrate from the site following the implementation of the remedy. [l]

Response: The total tonnage attributed to each generator customer of Rubatino Refuse Removal, Inc. (RRR) was based on documents prepared by RRR at the time of landfill operations, including daily trip reports, and on sworn testimony of RRR drivers. Where driver information showed a consistent waste generating activity for a party during the period 1975-1979 - such was the case for WW Wells Millwork - EPA calculated the total volumetric contributions of each generator customer for that period using the average monthly volume of documented waste activity during the 1978 period as the basis. The waste volume was then converted to tonnage using a conversion factor of 283 pounds/cubic yard.

The public meeting that the commentor attended was for the purpose of discussing the Proposed Plan for the Tulalip Landfill Superfund Site, not the details of the de minimis settlement. EPA held separate informational meetings with de minimis parties, and made all information upon which party-specific volume decisions were made available to the de minimis parties for review and comment prior to responding to the settlement offer.

The commentor is correct that response actions at the site may be ongoing for some time. However, the de minimis settlement is an opportunity for eligible parties to settle their potential liability for response costs with regard to the site. As noted in the Response to Comment 4.0 above, the settlement provides important benefits to settling parties, including a covenant not to sue and contribution protection, in exchange for paying a share of past and future response costs at the site. Taken together, a covenant not to sue, contribution protection, and other de minimis settlement terms provide a high level of certainty that settling parties will be protected from future legal actions related to the matters addressed in the settlement.

6.0 Comment: Commentor asked why the pre-1980 users of the landfill are being asked to pay to clean up the site. [l]

Response: Pre-1980 users of the landfill are being asked to pay to clean up the Site because EPA has evidence that the waste they brought to the Site contained hazardous substances. The pre-1980 users of the landfill fall within the definition of liable parties under section 107 of CERCLA, 42 USC 9607, and are therefore responsible for the payment of response costs.

EPA is issuing de minimis settlement offers to parties who contributed between 0.01 and 0.6 percent of the total waste at the site. Parties with waste contributions above 0.6 percent are not eligible for a de minimis settlement offer, but have been or will be invited to participate in an allocation process. There are thousands of parties who contributed less than 0.01 percent. EPA has no plans to offer settlements to these very small contributors at this time because of the substantial administrative costs that would be incurred relative to the very minor contributions likely to be recovered.

Comment: Commentor wanted to know what the impact of the baseline risk assessment would be on the current time table for PRPs who have and have yet to receive de minimis settlement offers. The commentor also asked about the cost basis for parties who are potentially liable who have not yet received de minimis offers and whether those that have will-have their offers re-evaluated. [2]

Response: The comprehensive Baseline Risk Assessment will have no effect on the time table for the de minimis settlements. The two processes are proceeding independently. In addition, EPA does not expect the cost basis for the de minimis settlements to change. This is an early de minimis settlement and therefore total site costs are estimated as accurately as possible based on current information. Early settlement offers give parties an opportunity to "cash out" early in the process so as to avoid further involvement at the site. The actual total site costs may turn out to be lower or higher than the amount estimated for purposes of the settlement offer. Thus, though settling de minimis parties risk that the costs will be lower than anticipated by EPA, EPA risks that the costs will be higher than anticipated and EPA will not be able to seek those extra costs from the parties who have already settled.

8.0 Comment: Commentor suggested EPA use the concept of periodic payments to settle the PRP's liability rather than a lump sum. Commentor stated that this payment philosophy, as described by the commentor, is modeled from personal injury tort litigation. The commentor explained that an advantage of this method is

that the defendant can typically settle the case for less money and the plaintiff can typically receive more money. The commentor also suggested that favorable tax consequences often result for both parties. The commentor explained that the defendant receives the current tax deduction for their expenses for the settlement case. In addition, the defendant is able to settle the case at a lower cost because the settlement is spread out over time and it is, in effect, annuitized. Consequently, the commentor explained that the plaintiff faces no tax consequences. [2]

Response: EPA appreciates the commentors suggestion.

ATTACHMENT B

FIGURES

4-1

AND

4-2

ATTACHMENT C

LIST OF REFERENCES

This List of References is meant to assist the reader in locating documents cited in this Responsiveness Summary and is not meant to serve as an exclusive listing of all documents EPA relied on in determining the need for, remedial action or selecting the remedy for the Tulalip Landfill Site.

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Winiecki, E. 1995d. Memorandum to The File by Eric Winiecki regarding EPA comments on the Treatment Berm Alternative including Development and Evaluation of the Treatment Berm Alternative, dated June 30, 1995. 4 August 1995.

Winiecki, E. 1995e. Letter to Larry Adams, Monsanto, regarding response to the Respondents' request for RI/FS Work Plan modifications at the Tulalip Landfill, dated February 17, 1995.

Woods, B. 1996. Memorandum to L. Priddy, regarding comments by Parametrix on the data quality of the 1988 data for Tulalip landfill. 31 January 1996. U.S. Environmental Protection Agency.

The Administrative Record is available for public review at the United States Environmental Protection Agency, Records center, 1200 6th Avenue, Seattle, Washington and at the Marysville Public library in Marysville, Washington. To request a copy of a document in the Administrative Record, call the EPA Records Center at (206) 553-4494.

APPENDIX E

**EPA REVIEW COMMENTS
ON THE
COMPARISON OF THE LEACHATE COLLECTION AND THE TREATMENT ALTERNATIVE (2B) WITH THE FML COVER ALTERNATIVE (4C), DATED OCTOBER 24, 1995**

During the public comment period for the Proposed Plan, the Respondents submitted new information to EPA regarding a variation of Alternative 2b - Leachate Seep Collection with Treatment Berms. This document, dated October 24, 1995, is entitled "Comparison of the Leachate Collection and Treatment Alternative (2b) with the FML Cover Alternative (4c)" (Golder, 1995b). The document provides detailed information on sending collected leachate to an off-Site sewage treatment plant, or Publicly Owned Treatment Works (POTW), instead of through treatment berms. EPA has evaluated both of these variations in the interim ROD, differentiating them as follows:

- Alternative 2b - Leachate Seep Collection with Treatment Berms; and
- Alternative 2b(ii) - Leachate Seep Collection with Discharge to POTW.

Alternatives 2b and 2b(ii) use the same basic leachate collection system. The main difference between the two alternatives is that one would send the collected leachate to treatment berms, the other to a POTW. According to the proposal, under Alternative 2b(ii) the leachate would be sent to either the Marysville or Everett POTW where it would be treated along with other effluent streams received by the POTW.

This Appendix presents EPA's technical comments on the October 24, 1995 submittal. For EPA's evaluation of Alternative 2b(ii) using the NCP criteria, refer to interim ROD Section 9.0 - Summary of the Comparative Analysis of Alternatives, and interim ROD Appendix A.

GENERAL COMMENTS

1. Alternative 2b and Alternative 2b(ii) share the same basic leachate collection system. Many comments EPA has made previously about the collection system proposed for Alternative 2b also apply to the Alternative 2b(ii). However, many of EPA's concerns were not addressed in the October 24, 1995 submission (Golder, 1995b). EPA expressed the following concerns about alternative 2b:

- difficulty of constructing trenches for the leachate collection system through landfill waste;
- difficulty of installing level collection pipes in several feet of standing water at the bottom of the trenches;
- difficulty in accessing the collection pipes for repairs;
- clogging of collection pipes over time;
- relatively high operation and maintenance (O&M) costs; and
- lack of adequate data or technical analyses to support the Respondents' claims that the proposed collection system would eliminate leachate seepage.

These concerns are also applicable to 2b(ii) because of the similarities between the two systems. The October 24, 1995 submittal could have, but did not, attempt to address these concerns relative to 2b(ii). In EPA's August 3, 1995, letter to the Respondents (Eric Winiecki, EPA, to Anthony Burgess, Golder Associates) transmitting EPA's review of the "Development and Evaluation of the Treatment Berm Alternative (Golder, 1995c), which describe Alternative 2b, EPA stated on page 7:

> The SAC reports submitted to date, including the subject report, have not provided adequate justification to support the statement that all leachate seepage would be eliminated by the treatment berm or similar leachate interception alternative.

To date, this justification has not been provided to EPA.

2. There are numerous uncertainties associated with the leachate collection and treatment alternative. Adequate trench design and spacing is heavily dependent on hydraulic properties of the waste. There is reference to aquifer testing to try to confirm these properties. However, EPA notes that these are landfill waste materials, which are expected to be less homogenous than soil media or sediments. The boring and

testing programs for defining the hydraulic properties to allow a reasonable confidence level with the design of the spacing of the trenches is likely to be extensive. The trench spacing provided in the Respondents' submittals is highly conceptual, a best guess, based on very limited data in Zone 1. The trench depth, as proposed, ranges from 12-25 feet with a minimum width of 3 feet, depending on waste consistency. The volume of waste to be excavated is consequently also very speculative, as it is dependent on all the above. EPA questions the viability of returning all of excavated waste to the same trenches as proposed, versus the potential need for other, additional disposal options. This has not been sufficiently evaluated.

3. The document inappropriately downplayed the potential for plugging and its impact within the leachate collection system. The cost estimate for the leachate collection and treatment alternative should have specifically identified, in addition to contingency for unexpected events, corrective actions to be followed (e.g., digging up and replacement of portions of the interceptor trench, etc.) to address plugging within the interceptor trenches, including operation and maintenance (O&M) funds to implement these corrective actions.

4. The advantage of using low permeability landfill covers to reduce infiltration into landfills and consequently reduce leachate production is that it is a proven technology with respect to materials, installation, and the ability to operate and maintain the system. Construction and Quality Assurance (CQA) procedures for installation-and repair of FML landfill cover systems are well established, including ASTM standards and EPA guidances. In contrast, the Respondents who proposed the 2b(ii) approach did not submit information that supports 2b(ii) as a technology that is proven for the use and circumstances for which it has been proposed.

5. Based on evaluations performed by the Respondents, the selected alternative (4c) is expected to result in lower rates of leachate migration to Zone 2 than Alternatives 2b or 2b(ii). The lower rate of leachate migration to Zone 2 expected from Alternative 4c has a relatively high degree certainty because low permeability landfill covers are a proven technology with relatively predictable results. The leachate migration rates associated with Alternatives 2b and 2b(ii), on the other hand, are relatively uncertain because Collection systems of this type are unproven. Consequently, the expected rate of leachate migration that may result from implementation of Alternates 2b and 2b(ii) is subject to numerous uncertainties (see the following comments). Because the estimated lower leachate migration rates associated with Alternative 4c are considered to be more certain estimates, the fact that these numbers are lower must be viewed as very significant. Alternative 4c is expected to meet all RAOs without the need for additional contingencies. During the detailed design phase, Alternative 4c can be optimized to minimize waste excavation and soil importation.

6. It is likely that the cost estimate for the leachate collection and treatment alternative 2b(ii) is significantly underestimated due to the critical inputs (i.e., trench spacing, etc.) into the analysis being really more appropriately characterized as best guesses versus conservative or non-conservative assumptions. A more realistic cost estimate for Alternative 2b(ii) has been prepared by EPA (see Table 1 in this Appendix).

7. Some information was provided for the Everett POTW that was not provided for the Marysville POTW. Information should have been provided for both POTWs since both were proposed as potential recipients of landfill leachate.

8. Current landfill gas emission of methane at the Tulalip Landfill is estimated to be 228,000,000 cubic feet per year (HLA, 1994b). This quantity would likely increase as the water levels in the landfill decrease thereby enabling additional refuse degradation. Furthermore, constituents of landfill gas can cause offensive odors or threaten human health. PSAPCA regulations provide requirements for allowable gas emission rates, air emissions detrimental to persons or property, and odor and nuisance controls measures. Landfill gases generated under the scenario depicted by Alternative 2b or 2b(ii) would be released to the atmosphere since these alternatives possesses no provisions for containment of such gases.

For alternative 4c, a gas collection system consisting of a piping and trench network would be installed beneath the low permeability cover. The recovered gases could then be treated by incineration or flares as necessary.

SPECIFIC COMMENTS

1. Page 3, Section 2.1: It is unclear from the description of the biopolymer slurry technique how the drainage media (both drain piping and filter pack) would be installed, and what impact residue from the slurry would have on the interceptor trench's performance. Supporting documentation and references for the biopolymer slurry technique should have been provided.

2. Page 4, Section 2.1.1: The reference to treatment berms in the first sentence appears to be incorrect, since Alternative 2b(ii) does not include treatment berms.

3. Page 6, Section 2.2: a) Copies of the chemical and flow data presented to personnel at the Everett and Marysville POTWs should have been provided in an appendix to the report.

b) A discussion of the compliance status for each of the POTWs should have been provided. CERCLA wastewaters are prohibited from being sent to a facility that is not in compliance with its permits.

c) The mechanisms (e.g., monitoring and reporting requirements) that each POTW would employ to ensure that the wastestream will be acceptable to its treatment system over the long term should have been provided.

d) The hydraulic capacity of each POTW is discussed. However, discussion of other technical issues should also have been provided, such as the organic loading capacity of each POTWs treatment system; the suitability of each POTW's treatment systems for the wastestream; and whether each treatment system would be expected to treat the leachate constituents, and to what degree.

4. Page 7, Section 2.3: This section should have included descriptions of the monitoring measures required to maintain the system. As a minimum, these measures should have included float controls, redundant processes for mechanical equipment, and performance monitoring of the trenches and piping network. Monitoring controls for this alternative are likely to be more numerous, substantial, and costly than for Alternative 4c.

5. Page 8, Section 2.5.1: a) Clogging of the interceptor trenches from siltation or biofouling remains an important concern for this alternative since detection of a localized blockage would be difficult. The appropriate selection of aggregate and/or geotextile would be difficult due to the variability of soil and refuse across the site. Moreover, correct placement of these materials may prove complicated, particularly when using a slurry to maintain trench integrity. These issues should have been discussed in more detail.

b) The comparison of a trench pipe system to a screen in a well is not a valid comparison. A drainage trench such as those proposed for Alternative 2b(ii) cannot be developed in a similar manner to a well screen because a trench has different fundamental characteristics than a well, including horizontal position, long lengths, and inability to create the forces necessary to move the fine material near the screen.

6. Page 9, Section 2.5.2: More information should have been provided regarding the potential need for pretreatment of the leachate prior to discharge to each POTW. According to the Department of Ecology, the results of dilution effects testing and a stream loading study of the Snohomish River is anticipated to result in modifications to the Everett P0TW's NPDES permit limitations. Both the Everett POTW and Ecology have indicated the potential for ammonia to be included in future effluent limits.48 This could result in the need for the leachate to be pretreated prior to discharge to a POTW.

7. Page 10, Section 3.1: a. The statement that all RAOs are achieved by this alternative [2b(ii)) is incorrect. The RAO for landfill gas requires prevention inhalation and releases of landfill gas exceeding ambient levels or PSAPCA regulation standards. Leachate collection and treatment Alternative 2b(ii) will not likely meet this RAO, and may not meet many others (see Response to Comment 13.13.)

b. The document should have specified whether the pipeline(s) between the landfill and the POTW would be dedicated to the Tulalip Landfill leachate, or if they would be linked to other sanitary or storm sewer systems, nor did it include a discussion of appropriate containment measures for the wastestream.

8. Page 10, Section 3.2: This document has not provided adequate justification to support the statement that all leachate seepage would be eliminated by the proposed leachate collection system. This concern remains unaddressed.

9. Page 11, Section 3.3: This section should have indicated whether the POTWs were willing to accept the leachate for the entire duration of the discharge (potentially indefinitely), and should have provided supporting documentation of this from the POTWs.

48 EPA notes that ammonia nitrogen is also a major contaminant of concern discharging from the Tulalip Landfill.

10. Page 12, Section 3.3: The claim that the interception system for Alternative 2b(ii) "provides greater certainty that this RAO will be achieved than the FML cover alternative (4c)" is inconsistent with Figures 4-1 and 4-2. Predicted flux out of the landfill into the Zone 2 aquifer is significantly greater with leachate interception than with Alternative 4c, particularly after 5 to 6 years. The cumulative leachate flow into the environment from the landfill under the leachate interception scenario exceeds the amount for

Alternative 4c. Further, supporting evidence for the interception system's "high degree of reliability that the leachate seeps will be eliminated" has not been provided (see comment 8 above).

11. Page 13, Section 3.6: The technical implementability discussion should have included consideration of the long term potential need for pretreatment requirements that could be set by the receiving POTW based upon new effluent limits. As indicated in the comment regarding Section 2.5.2, both Ecology and the Everett POTW anticipate new limitations.

12. Discussions of administrative implementability should have the following:

a. Effluent limits for the Marysville POTW were recently developed based on the current wastestreams. New wastestreams could require revisions to the permit. The POTW authority may be hesitant to go through this process again so soon. Also, contacts at this POTW indicate that several months of continuous monitoring data would be required to assess the characteristics of the wastestream prior to acceptance. Local limits for the discharges to the POTW are expected to be developed sometime next year, and may also trigger pretreatment requirements.

b. Local ordinances can restrict POTWs from accepting waste streams from outside their established service areas. This issue should have been evaluated and discussed for the Everett and Marysville POTWs.

13. Page 13, Section 3.7: Given the numerous technical uncertainties associated with Alternative 2b (ii), EPA has developed a more realistic cost estimate for the alternative using assumptions that are more appropriately conservative. EPA estimates the cost for Alternative 2b(ii) to be $20.8 million (see attached table). EPA's assumptions used for used for the cost estimate include:

- A lower horizontal permeability for the refuse was assumed and the trench spacing was reduced to 200 feet.
- Conventional excavation techniques were assumed with trench integrity being maintained by shielding or trench boxes or sloping. Excess trench spoils were assumed to be disposed in a municipal landfill.
- Due to the likelihood of trench spoils being saturated, it was assumed the spoils were dewatered on a pad of HDPE and drainage media.
- EPA assumed regrading, placement of imported cover material, and revegetation of over ½ of the landfill would be necessary to prevent human exposure of wastes and contaminated soil.
- The quantity of gravel backfill was increased to 23,000 cubic yards. This amount assumes the trench to be 4.2 feet wide and the depth of gravel to be 5 feet (5' deep x 4.2' wide x 29,600' long = 23,022 cubic yards).
- Waste disposal costs were increased to $60/cubic yard to reflect disposal facility tipping fees ($42/cubic yard) as well as loading and hauling costs ($18/cubic yard).
- Operation and maintenance (O&M) costs for the 24 extraction sumps was increased to $30,000. This value assumes monthly inspections and periodic repair and/or replacement of each pump at an annual cost $1,250 per pump.
- Costs for POTW disposal were increased based on estimates from the POTWs.
- Annual maintenance of the sumps and trenches to eliminate siltation build-up and biofouling; includes periodic replacement of drainage media in the interceptor trenches.

14. Page 15, Section 4.1:

- The third sentence of the second paragraph is incorrect. Evidence suggests that potential surface water ARARs are not achieved at the point where groundwater discharges to surface water.
- The document's claim that degradation of a low permeability cover should be expected as a result of "surface activities and natural weathering" is unfounded. As the Respondents in the past have stated, an engineered cap would support the expected future land use activities. Further, exposure of the cover, and therefore degradation to natural weathering would not normally be expected. To suggest that degradation from future land use or weathering is eminent or even likely is misleading.

15. Page 17, Section 4.3: The last sentence is misleading and should have been omitted. Deterioration of an FML layer in a properly constructed cover system is improbable; membrane liners subjected to intense accelerated aging tests have routinely demonstrated that geosynthetics should last almost indefinitely. Other potential breaches from punctures or tears are equally unlikely when accounting for the anticipated loading with respect to the design strengths of the geosynthetic materials available. Field seams would be aggressively tested to insure water-tightness, and a quality assurance program, as well as field placement oversight, would provide a final safeguard against leaks caused by improper installation.

16. Attachment A: The data provided by the Respondents to the POTW regarding the Respondent's expectations of the leachate and its wastewater characteristics should have been provided in this attachment.

17. Page B-1, Attachment B: This attachment provides an "apples-to-oranges" comparison because it treats sites that include caps the same as sites that don't. For a proper comparison, the average cost per acre should only include costs for sites employing low permeability caps. In doing so, the appropriate average cost per acre for landfills that are truly greater than 80 acres is $173,000, compared to an estimated cost of $171,000 per acre for Alternative 4c. In addition, EPA notes that the cost estimates presented on page B-1 should have been adjusted for inflation, which would further increase the $173,000 figure relative to the selected Alternative (4c). EPA concludes that the cost per acre for Alternative (4c) is comparable or less than the cost per acre for landfills of similar size.

EPA Cost Estimate for Alternative 2b(ii) - Leachate Seep Collection with Discharge to Publicly Owned Treatment Works (POTW) **Table 1**

	Quantity	Units	Unit Cost	Cost	Notes
CAPITAL COSTS					
Signs	24	each	$500	$12,000	
Deed Modification	1	LS	$5,000	$5,000	
Monitoring Plan	1	LS	$50,000	S50,000	
Cleaning and Grubbing	18	Acres	$3,500	$63,000	
Surface Regrading	1	LS	$100,000	$100,000	
Pre-design Testing	1	LS	$500,000	$500,000	
Permitting/Easements/Crossings	1	LS	$200,000	$200,000	
Interceptor Trench					
Excavate Trench & Haul to Stockpile conventional	78.620	CY	$8	$628,960	17 ft average depth,
Stockpile Pad	10,000	SF	$3	$30,000	
Place Perforated Pipe	29,600	LF	$12	$355,200	12 in dia. pipe
Gravel Backfill	23,000	CY	$14	$322,000	5 ft deep
Waste Disposal	32,360	CY	$60	$1,941,600	Municipal Landfill
Soil Cover	15,350	CY	$10	$153,500	2 ft deep
Extraction Sumps	24	Each	$15,000	$360,000	
Cover					
Regrade on-site soil	150,000	CY	$2	$300,000	Assumes covering ½ the landfill
Cover Material	118,000	CY	$12	$1,416,000	Locally available select material
Vegetation	73	Acre	$1,500	$109,500	Conventional seeding
Prepare Cover Material	118,000	CY	$1	$118,000	Roll
Pipeline					
0n-Site Pipeline with Trench	4,000	LF	$25	$100,000	3 ft deep, 2 ft wide
Pump Station	1	LS	$100,000	$100,000	400 gpm pump
Pipeline to POTW with Trench	21,000	LF	$25	$525,000	3 ft deep, 2 ft wide
Pipeline Monitoring/Controls	1	LS	$30,000	$30,000	
POTW Hookup Charges	58	MGal/yr	$33,000	$1,914,000	
Subtotal Capital Costs				$9,333,760	
Contractor Overhead & Profit			10%	$933,376	
Engineering			8%	$746,701	
Construction Surveillance			3%	$280,013	
Contingency			25%	$2,333,440	
Total Capital Costs				$13,627,290	

Operation and Maintenance (O&M) Costs					
POTW Discharge fees	58	MGal/yr	$4,400	$255,200	
POTW Insp/Monit Fees		per annum	$4,000	$4,000	
Pump Station Operation/Maintenance		per annum	$10,000	$10,000	
Trench Maintenance/Cleanout		per annum	$20,000	$20,000	Includes sediment removal
Sump Maintenance		per annum	$30,000	$30,000	
Annual Groundwater Monitoring Costs		per annum	$50,000	$50,000	
Sign & Gate Maintenance		per annum	$3,000	$3,000	
Subtotal O&M Costs				$372,200	
Contingency			25%	$93,050	
O & M Costs				$465,250	
Present Value of O&M Costs	30	years		$7,152,033	Discount Rate = 5%
Total Alternative Cost (Net Present Value)				$20,779,322	